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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION.

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Forthcoming Events.

JUNE 29-JULY 4.

History of Science and Technology:—Second International Congress, in London.

JULY 13-18.

British Chemical Plant Exhibition:—Central Hall, Westminster.

JULY 13-19.

Society of Chemical Industry:—Jubilee meeting in London.

Institute of British Foundrymen.

JULY 11.

Lancashire Branch:—Branch picnic and visit to Grin Quarries of the Clay Cross Company.

Low-Temperature Carbonisation.

The low-temperature carbonisation process for distilling coal is of vast importance to the founding industry, because it has been said that its future depends on the production of a cheap cast iron for retorts capable of sufficiently long life; the strides made by the Cast Iron Research Association in this direction are now generally known.

The process is under a cloud at the moment as the slump in the price of residual oils makes it temporarily unprofitable, but it is, nevertheless, of great importance to us as a nation, for it is a means of enabling us to make our own oil from our staple mineral coal, and thus rendering us independent of foreign nations. Also, a legislative enactment forbidding us to use raw coal as a domestic fuel, thus lengthening the lives of all of us through purer atmosphere, freedom from fog and so on, would compel us to use the coke fuel of the low-temperature process. It does burn more freely than the coke of the high-temperature process carried on in gas works.

We note that Sir David Llewellyn has been casting doubt on the future of the low-temperature process, and it is extraordinary that of all the people who are endeavouring to make this process go, coalowners themselves are conspicuously in a minority. A more balanced view was given recently in the House of Lords by Lord Rutherford, better known as Sir Ernest Rutherford. He said that "it is scientifically possible to provide the bulk of our oil by the treatment of our coal." He did not, of course, say that it was economic to do so; but then, nobody can calculate what it costs us per annum in human inconvenience, illness and misery through the foul atmosphere of our cities.

We therefore deprecate attempts to crab the process of low-temperature carbonisation, and should regret its disappearance during the present period of economic stress, in which the price of petrol (excluding the tax) has fallen so low. The petrol reserves of the world are not illimitable, and during a period of prosperity the price is bound to rise. We are, therefore, glad to see that the Admiralty has called for tenders for home-produced oil suitable for battleships. In this connection also, the widening use of the heavy-oil engine as compared with the petrol engine, should not be forgotten.

Progress.

The outstanding success of the Birmingham Convention of the Institute of British Foundrymen, and particularly the reading of the first annual report by its founder, Mr. Finch, induced in some of the older members a reminiscent mood, associated with thoughts as to why and how such progress has been achieved.

It is abundantly clear that, sooner or later, an association of this character had to come into being. Twenty-eight years ago the then kindred societies virtually ignored the foundry industry, and, as is quite common, full use of the technical Press was made to bring about incorporation. We are proud of the help given by our predecessors. In the development of the Institute there are certain outstanding events which have contributed very materially to its welfare, and it is to their creators and organisers that the industry is so much indebted. The first important step was the procuring of a Royal Charter. The next was the establishment of foreign relationships with kindred bodies, culminating in a series of international gatherings. The first conference organised on the lines now so greatly appreciated was in Birmingham in 1922, when an exhibition was also staged. This was followed in 1923 by a visit of an important delegation of American foundrymen, resulting in the first international gathering in Paris of foundrymen from all over the world. Large assemblies of foundrymen gathered in Newcastle in 1924, in Glasgow in 1925, and in London in 1926. This conference also carried an exhibition and was somewhat international in character, but undoubtedly it suffered from the effects of the general strike. Highly successful conferences at Sheffield and Leicester followed in 1927 and 1928, whilst in 1929 real impetus was given by the staging in London of an outstanding important international conference. Since that time Middlesbrough and Birmingham have acted as hosts to the Institute.

Interest to-day is keener than ever within its history, and the active membership, as is demonstrated by a glance at the names of the participants at the last convention, is largely of the administrative, executive and scientific branches of the industry. There are now envisaged radical additions to the work of the Institute, and on the success of these will depend its progress, for they are of a penetrating character destined to affect the technical structure of the foundry industry and its relationship with allied trades and their technical organisations.

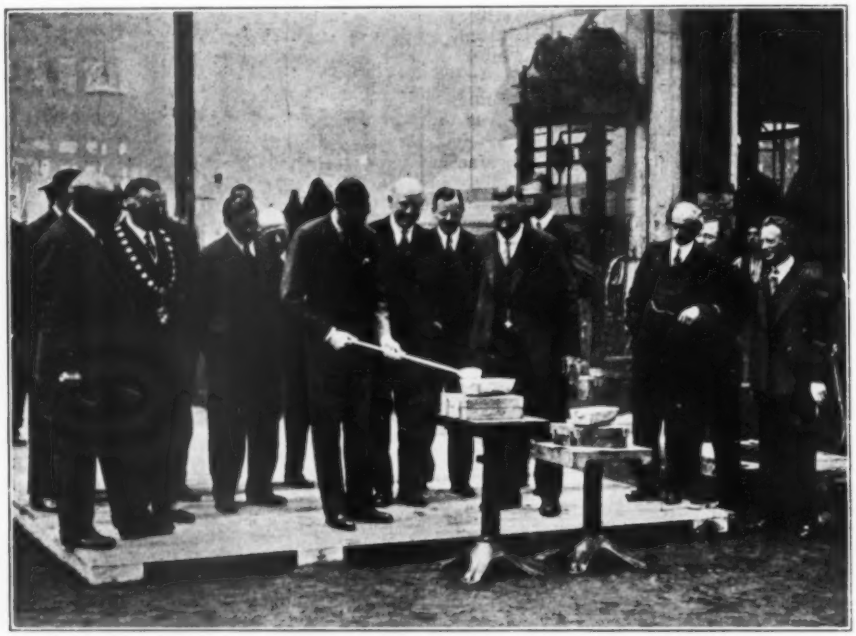
XUM

Visit of H.R.H. Prince George to Trafford Park Works.

At the end of his northern tour, and immediately previous to his departure by air for London, Prince George visited the Trafford Park Works of the Metropolitan-Vickers Electrical Company, Limited. His Highness was received by Sir Philip Nash and the following directors:—Messrs. G. E. Bailey, A. P. M. Fleming, P. S. Turner, K. Baumann and also members of the management committee.

Whilst in the foundry the Prince saw the metal being poured for the yoke of a large rolling-mill motor, and here he poured a casting of a medallion of himself in an aluminium-silicon alloy, a recent production of the firm, which has very special properties of lightness and ductility.

The properties of the alloy are, in brief, as follow:—It is lighter than pure aluminium, and its strength and ductility exceed the requirements of Admiralty, Air Ministry and B.E.S.A. Specifications; it is very resistant to atmospheric and sea-water corrosion, and is approved by the Admiralty in this as in other respects; it has excellent fluidity and gives clean castings free from cracks, cavities and porosity; it has excellent machining properties, and can be welded easily and effectively; it can be forged, rolled or drawn; it can be spun, pressed or stamped; it takes and keeps a fine polish; it is consistent and reliable in all respects, and, casting for casting, it is cheaper than brass.



H.R.H. Prince George Receiving Tuition in the Art of Pouring Castings from Mr. W. Jolley in the Metropolitan-Vickers Foundry.

Accompanying the Prince, in addition to his Equerry, were Lord Derby, the Lord Mayor of Manchester, the Town Clerk, the Chief Constable for the County of Lancashire, the Chief Constable of Manchester, Alderman Sir William Davy, the Mayor and Clerk to the Council of Stretford.

The Electric Furnace Company, Limited, 17, Victoria Street, London, S.W., report an interesting contract received from a Continental steelworks for a high-frequency furnace installation which will be the largest unit hitherto constructed. The motor-generator set will have a power input of 1,375 kw., and the furnace will be capable of melting 4-ton charges. Provision will also be made for a furnace body of 7 tons capacity for the treatment of molten metal.

Institute of British Foundrymen.

List of Members Attending Birmingham Convention.

J. Affleck, Glasgow; S. Aldridge, Walsall; F. Allan, Sunderland; T. F. Allen, Birmingham; A. E. Allen, Birmingham; A. L. Allford, Leamington; J. Arnott, Glasgow; J. W. Athey, West Bromwich; W. Auckland, Bolton.

A. H. Baker, Wolverhampton; W. Baker, Wolverhampton; F. A. Ball, Stratford-on-Avon; T. G. Bamford, Wednesbury; E. Bean, Abadan; A. S. Beech, London; James Bell, Newcastle; John Bell, Glasgow; C. W. Bigg, Derby; C. Blades, Syston; W. P. Blumfield, Ipswich; N. C. Blythe, Birmingham; L. W. Bolton, Birmingham; E. M. Boote, Coventry; H. Bradley, Sheffield; A. Brailsford, Stafford; C. F. Brereton, Manchester; B. Brodie, Stockton-on-Tees; G. Buchanan, Bilston; G. R. Buckley, Staveley; H. Bunting, Derby; K. M. Burder, Loughborough.

G. M. Callaghan, Birmingham; J. Cameron, Past-President, Kirkintilloch; A. Campion, Glasgow; E. Carey-Hill, Coventry; E. A. Carlisle, Sheffield; G. C. Castle, Sheffield; C. W. Coleman, London; Miss Morris, London; E. H. Cottle, Birmingham; F. J. Cook, Past-President, Birmingham; W. N. Cook, Manchester; J. H. Cooper, Darlington; F. M. Cramb, Bath; F. J. Cree, Rochester; Miss N. Crook, Manchester; M. Curnow, West Bromwich; E. M. Currie, Coventry.

D. Dalrymple, West Bromwich; J. Davenport, Leyland; V. Delport, London; H. C. Dews, London; E. C. Dickinson, Coventry; F. E. Dobson, Birmingham; W. E. Dobson, London; Dr. J. W. Donaldson, Glasgow; Mr. Duff, Chesterfield; J. Dunn, Willenhall; J. Durrans, Penistone; P. Durrans, Penistone.

A. Edwards, Cheltenham; R. Etheredge, Wembley; S. Evans, London; Dr. A. B. Everest, London.

V. C. Faulkner, Past-President, London; J. Feasey, Lincoln; J. A. Fenton, Rugby; H. Field, Wolverhampton; F. W. Finch, Stroud; L. G. Firth, Sheffield; A. Firth, Sheffield; T. C. Firth, Sheffield; P. Flavel, Leamington; S. W. B. Flavel, Leamington; W. J. Flavell, West Bromwich; C. Fontaine, Newport; J. E. Fletcher, Dudley; N. J. Fox, Walsall.

B. Gale, Nottingham; T. H. Gameson, Bir-

(*Continued on page* 431.)

Random Shots.

Now that our own convention has retired, so to speak, to don the sober black uniform of the "Proceedings," "Marksman" has assumed an Oliver-Twist expression that hungrily asks for more. In his opinion, one convention doesn't make a summer. Didn't Shakespeare once exclaim, "Oh! for a life of conventions?" Well, perhaps he never; perhaps he said "sensations" instead; perhaps it wasn't Shakespeare at all. It matters very little to me, because all that I was trying to do was to avoid the brutal directness of Freudian jargon in confessing to a convention complex.

* * *

Conventions fascinate me. The mere receipt of tentative programmes and final programmes, the filling-up of forms or the not-filling-up of forms, the arrivals of little packets of tickets and larger packets of Papers, are themselves sufficient to set me abubble with excitement, while the actual events go to my head like rich Burgundy. Those of you who attended the Liége Congress last year will recall, no doubt with vast amusement, the unfortunate incident of the vermilion dressing-gown. . . . But forgive me; this is no right place for memoirs—discreet or otherwise.

* * *

To me, therefore, the prospects of the approaching September are particularly entrancing. To begin with, at Zürich the N.I.A.T.M. will be holding its first Congress. This concluded, on the following day, also at Zürich, commences the annual meeting of the Institute of Metals, of which the programme, with its "Luncheon on the summit of the Rigi," and journey through Lucerne and Interlaken, is as seductive as any I have seen for a long day. And there is the Autumn Meeting at Swansea of the Iron and Steel Institute.

* * *

Lastly, but of most interest to founders, there is the International Foundry Exhibition and Congress at Milan. It seems to me a great pity that the congress should coincide with the Institute of Metals meeting; nevertheless, those who attend the latter will have ample time to visit the Exhibition, if they so wish, as it does not terminate until September 27.

* * *

For purely selfish reasons, I hope that at least one British firm will be showing at the Exhibition. There is nothing more heartening in foreign climes than the British welcome whose formula is, first the handshake and then the glass. But up to the present our equipment people have expressed no intention, and have displayed no great willingness, to take on the task of performing this little ceremony. Questioning an acquaintance whether he would be Stand-decorating in Milan, I received the very strange reply of, "No, I detest macaroni." When I pointed out that macaroni didn't exhaust Italy's culinary resources, he guffawed most rudely. Inexplicable, is it not?

* * *

Imaginary Intimate Interviews.

VIII.—*The Advertising Consultant.*

Now, my dear Sir, do please believe that I speak with all sincerity of heart and with not one thought of pecuniary interests when I declare that to-day no business house can progress, can ever hope to progress, without making the fullest use of advertising. The firm that can afford to dispense with it has yet to exist. It is both weapon and armour, whereby new markets can be captured and old ones defended. Whether a company manufactures pills, pencils or popguns, that company must advertise, and advertise efficiently. I am in an unequalled position to help them to do that. What is it you say? Do I advertise? Well, candidly, I haven't yet found the time to begin, so numerous are my clients. But, believe me, I speak with all sincerity of heart. . . .

Marksman.

Institute of British Foundrymen.

ANNUAL BANQUET AT BIRMINGHAM.

The 28th annual banquet of the Institute was held at the Grand Hotel, Birmingham, on Wednesday evening, June 10. The number of distinguished visitors and members present constituted something like a record, and there was every evidence of the fact that these annual gatherings of the Institute are becoming more and more important and appreciated. The President and Mrs. Harley received the guests, who included the Lord Mayor and Lady Mayoress of Birmingham (Alderman W. W. Saunders, J.P., and Mrs. Saunders), Viscount Ednam, M.C. (who had recently returned from a tour of South America in the company of H.R.H. the Prince of Wales and Prince George), Sir Herbert Austin, K.B.E., Sir Gilbert C. Vyle and Lady Vyle, Mr. F. P. Wilson, J.P. (Past-President), Dr. D. S. Anderson (Principal, Birmingham Central Technical College), Mr. V. Stobie (Senior Vice-President), Dr. Ing. G. Vanzetti (representing Italian Foundrymen), Councillor Mrs. Longden, Mr. F. W. Hobbs (representing South African Foundrymen) and Mrs. Hobbs, Mr. F. J. Hemming (President, Birmingham, Coventry and West Midlands Branch) and Mrs. Hemming, Mr. D. H. Wood (President, Foundry Trades' Equipment and Supplies Association), Mr. W. F. Brazener (President, Birmingham Metallurgical Society) and Mrs. Brazener, Mr. H. B. Weeks (Chairman, British Cast Iron Research Association), Mr. E. W. Hancock (Chairman, Institution of Production Engineers), Mr. J. Cameron, J.P. (Past-President), Mr. W. B. Lake, J.P. (Hon. Treasurer), and Miss Lake, Mr. Wesley Lambert, C.B.E. (Past-President), Mr. V. C. Faulkner (Past-President) and Mrs. Faulkner, Mr. F. J. Cook (Past-President) and Mrs. Cook, Mr. J. G. Pearce (Director, British Cast Iron Research Association), Mr. S. H. Russell (Past-President) and Mrs. Russell, Mr. J. T. Goodwin, M.B.E. (Past-President), and Mrs. Goodwin, Mr. J. Smith (President, National Ironfounding Employers' Federation), Mr. R. P. Bethell (President, Staffs Iron and Steel Institute), Mr. F. K. Neath (Hon. Convention Secretary and Treasurer) and Mrs. Neath, Mr. F. H. Hurren (Joint Convention Secretary) and Mrs. Hurren, and Mr. Tom Makemson (General Secretary of the Institute).

The Toasts.

VISCOUNT EDNAM, M.C., proposing the toast of "The City and Commerce of Birmingham," coupled with it the name of the Lord Mayor, and took the opportunity to express on behalf of the members of the Institute their warm thanks for the kindness and hospitality he had extended to them, and for the marked tribute he had paid them by according them a civic reception. (Hear, hear.)

The Lord Mayor, he said, like the greatest man in the world's history, was a carpenter by profession. If he had ever served in the pattern shop of a foundry he would appreciate how closely akin were the arts of the foundryman and the carpenter, and how much the one depended upon the other. The Lord Mayor's friendship towards British foundrymen on this occasion would establish a further bond of sympathy between those two historic basic industries upon which the entire fabric of the modern world had been constructed. In expressing his own personal gratitude for the hospitality extended to him that evening by the Institute, and for the fact that he had been entrusted with the responsibility of proposing this toast, Lord Ednam said he was very proud indeed of the close connection, extending over many centuries, which his family had maintained with industry, and particularly the iron trade of the Birmingham district. He was proud of the friendship and respect which had always been evinced towards them by ironmasters and foundrymen.

Immortal Work of Dud Dudley.

The Black Country was the very cradle of the history of iron making throughout the world; therefore, it was the cradle of the world's industry. It was here that iron was first made, from charcoal produced from the trees of the Wyre Forest. In his possession was a document submitted by his ancestor, Dud Dudley, to King James I, asking for a grant of a patent by Royal Charter of a process of his invention for making iron from coal. At that time all patents were granted by the King under Royal Charter. It was a pity that that system did not still exist (laughter); perhaps the only people who would be sorry if that were so were the members of the legal profession. It was interesting to note that the reason put forward by Dud Dudley as to why he should be granted his patent was that the amount of trees which were being felled through the Wyre forest for the manufacture of charcoal represented a great menace to our shipbuilding industry. The patent was granted and that process of manufacturing pig-iron was still used, and had never been improved upon to any appreciable degree. He was proud to think that the document referred to existed in the iron trade to this day as a technical standard handbook. So much water had flowed under the bridge since those early days of iron making that the world appeared to have almost forgotten the debt of gratitude it owed to the genius and ability of those early ironmasters and iron makers. It was they who had kindled and lit the flame of the iron industry, which flame had since developed into a roaring fire, extending to every corner of the earth, represented by the great network of industry upon which the lives and prosperity of so many millions of our fellow beings depended.

Increasing Competition.

The Birmingham district was the birthplace of many of the pioneers, and he asked foundrymen to remember that and to pay them a silent tribute. The more he travelled and the more he saw of the world's industries, the prouder he was of being British, and the prouder he became of that heritage handed on by our ancestors for all the nations of the world to take advantage of and profit by. It was a curious thing that so often, to our chagrin, we found that the weapon that was forged here was turned against us, with an even keener blade, by our rival and competing nations. We had been accused of having failed to keep the torch of that heritage burning so brightly as it was made to burn by other nations. We were told that our inventive genius was not so great as that of our ancestors, and that the processes they had invented had been improved upon less by us than by other nationals. That might or might not be so. He had been discussing it with the President, who had hotly denied the charge. (Hear, hear.) But then, the President was a very exceptional man; he was a Midlander, born in Scotland. (Laughter.) At any rate, it was not good enough for us to rest on the laurels which our ancestors had earned. What was good enough for them was not necessarily good enough for us. We had to face much keener competition than they had faced. Because processes and methods were British it did not necessarily mean that they were best.

Romance of Industry.

It was a very curious thing that if we adopted a method or a process of foreign invention we were rather suspicious of it at first, and our capacities were stimulated to improve it, and we did improve it; but if we applied methods which were of British origin, and had been practised for generations, our capacities were not so stimulated, and we were rather apt to get into the habit of thinking that what was good enough for our fathers was good enough for us. We must keep our manufacturing genius up to date. Unless we were continually inventing and improving, industry, which could be the most romantic thing in the whole world, became immediately humdrum and boring. If, when one went to one's works in the morning, something new was being tried, or old plant was being adapted to new methods, the day was exciting and interesting. Our forefathers' lives had been full of romance because they had been full of imagination; they were always building up, inventing and improving; we also must get a grip on the romance of industry by endeavouring always to improve our methods. The lives of our forefathers were romantic also because they were always wooing and conquering foreign markets—and foreign markets were just as exciting, fickle and difficult to retain as was a woman's affection. We must go on wooing these foreign markets. To use a vulgarism, our ancestors had "got off" abroad because they had spent many years practising commercial courtship to its greatest possible extent; we must not think that we could "get off" by sitting down and doing nothing. We had to carry on the wooing, and we had much greater competition than our ancestors had had to face. There was the suave suitor from Middle Europe and the "go-getter" from the Middle West, and they would not take "No" for an answer; we had our work cut out to maintain abroad the prestige which our ancestors had handed down to us.

Referring to some of his observations when accompanying the Prince of Wales and Prince George on their recent tour in South America, Lord Ednam recalled the remark made by the Prince of Wales, that our prestige abroad stood high, but that he did not think it stood high enough. He added that Senora Argentina and Senorita Chili were very anxious to flirt with us, but there were many rivals, and we had a long way to go before we could say that we had beaten all those rivals. He had been very proud to notice the trade-marks of Birmingham so widely spread throughout the sub-continent of South America. The name of "Birmingham" had been a household word there for many decades, and he hoped that it would long remain so. In every part of South America which he had visited, the name of "Birmingham" did indicate that the article to which it was applied was well manufactured, was worth buying, and was better than could be produced by rival manufacturers in other countries. (Applause.)

After references to the civic life of Birmingham, in the course of which references he said that Birmingham stood for the acme of municipal and civic propriety and efficiency, Lord Ednam reasserted his pride in being connected with the foundry trade as an ironmaster, and added, amid laughter, that he had been a foundryman and had made castings for Sir Herbert Austin and for the Institute's President (Mr. Harley), but, finding that it did not pay, he had given it up.

Birmingham's Historical Associations.

THE LORD MAYOR OF BIRMINGHAM (Alderman W. W. Saunders, J.P.), responding to the toast, first assured the gathering that the Lady Mayoress and himself were delighted to be present, and to see such a representative gathering of the Institute. In spite of the difficult times through which the country was passing, and to the difficulty which most of the members must have experienced in inducing their good ladies to believe that they were really attending a conference at Birmingham and not attending the Birmingham races (which he understood were in progress), he believed the number present constituted something in the region of a record, and

he hoped that the members who were visitors to Birmingham—he was not thinking of friends of the Black Country, who, like the poor, were "always with us"—would come again in the future. The people of Birmingham, he continued, were proud of many things, but their main pride came from the fact that they had to work for their living, and therefore, made no apology for the fact that their main interests and exhibits were of an industrial character. In the middle ages Birmingham was noted for its iron-workers, and in the present dark ages it is still noted for them. Some sort of a colony of people had lived in the neighbourhood from time immemorial but it was not until it had suddenly developed as an iron-working centre that Birmingham had attained importance and prominence, which, he ventured to say, it had not yet lost. William Camden, visiting Birmingham in the sixteenth century, had described the town as being "full of inhabitants and echoing with anvils—most of the inhabitants being workers in iron." The town, said the Lord Mayor, was still full of inhabitants, but, unfortunately, the anvils were not echoing as one would wish them to be. He did believe, however, that in common with their fellows in other parts of the country, the industrialists of Birmingham were not sitting down waiting and praying for a revival which would carry them again to the prosperity of former days, but that they, and the engineering and foundry concerns in particular, were modernising and re-organising their plant and equipment; in their laboratories they were working with undaunted energy, and success, to make a trade revival more speedy, and to give the laggard a good leg-up when it did appear. Those who had taken the opportunity to inspect some of the industrial undertakings in Birmingham could judge for themselves the truth of his statement.

Institute's Work Appreciated.

Birmingham appreciated very highly the work of the Institute of British Foundrymen, and appreciated how great an influence it had upon the progress of trade. The metal industries of Birmingham had been, and still remained, its staple trades, and without them Birmingham would not exist.

None of those present, remarked the Lord Mayor, amid laughter, grudged a single moment of the extra time Lord Ednam had taken for his speech, because he had been so practical. It was to be hoped sincerely that both the manufacturers and the workmen would take to heart what had been said by the Prince of Wales and Lord Ednam, as to the means of effecting a revival of trade, which revival we must have.

At the conclusion of a speech which was noted, not only for its sincerity but also for its many passages of humour, the Lord Mayor said he was delighted that the Institute had selected Birmingham as the centre for its deliberations this year. He expressed thanks for the kindness of the Institute in inviting the Lady Mayoress and himself to be present, and wished every success to it and to its members individually.

"Institute" or "Institution."

Sir Gilbert C. Vyle, proposing "The Institute of British Foundrymen," said that the Institute was one of the things of which Birmingham was proud, because it was made in Birmingham, and, consequentially, must be good. Its first meeting was held there in 1904, the name adopted at that time being "The British Foundrymen's Association." In 1921 it had achieved the singular distinction of obtaining a Royal Charter, and from that day it had progressed from success to success. It had 10 active branches in the industrial districts of the country, and its membership numbered more than 2,000. It was organised on a very wide and democratic basis, and its membership included all ranks, from the apprentice to that somewhat despised person—the managing director. (Laughter.) He hoped that within its organisation the Institute had been able to achieve a system of representative control better than, perhaps, we had been able to do in our national affairs, so that every class in the Institute had a proper say in the control. It was a society of craftsmen; yet, to all intents and purposes, it was a learned society, and, in his view, was entitled to rank as a learned society. One might inquire why it was an "Institute" and not an "Institution." An "Institution" was a learned society, and he had not yet been able to discover the difference between the one and the other. That might be a good subject for research. The word "foundry" signified a foundation, and in our present industrial situation it was most essential that we should get to the foundations of things in striving for efficiency. He suggested to foundrymen that they had in their own hands the power to make a very great contribution towards the recovery of this country's industry.

The foundry was the foundation of a great deal of the things we needed, and foundrymen, by discussing their problems together with a view to helping each other to produce the best castings, and castings which required the minimum of machining, could make a very valuable contribution towards the reduction of our production costs. He knew from experience that foundries which were well run and thoroughly efficient, both in the operations it had to perform and in the metallurgy it had to study, could help to recover an enormous amount of the money which was being spent, but which many people believed might not be spent. Lord Ednam had referred to the necessity for improving our sales—and the people of the Midlands, at any rate, were grateful to him for having spared the time to accompany the Prince of Wales on his most interesting tour of South America; but before we could concentrate on the art of selling we must reduce production costs to the minimum. The process of achieving that object would start in the foundry, and he hoped it would progress through every operation which followed the foundry processes.

Educational Activities.

Commenting, with pleasure, on the fact that the objects of the Institute were mainly educational, Sir Gilbert referred to the Institute's activities in connection with the establishment of certificates in respect of foundry training, and said it had at last achieved some kind of compromise in having, first, a craft certificate, and, secondly, a national certificate. This was a fine piece of work, because it showed that technique was being studied, and that the students were then questioned by practical people in order to find out how much they knew. It was all to the good that the examinations for the award of certificates were in the hands of practical people. Sir Gilbert also complimented the Institute upon the activities of the Committees it had set up to deal with specialised problems in the foundry business.

In a tribute to Mr. Harley, the President, whose name he coupled with the toast, he said that no association could pay a higher compliment to one of its members than to offer him the Presidency of its organisation. Mr. Harley had most admirable qualifications for this post. One might almost say that he had been born into the industry of casting; he was one of the few foundrymen who was at the same time an expert in the manufacture of steel castings, in iron casting and in non-ferrous metal casting. That was the most uncommon combination that he (Sir Gilbert) had ever come across, and the Daimler Company and the Institute of British Foundrymen were very fortunate in being served by Mr. Harley.

Carron and Coalbrookdale.

The President, responding, first expressed gratitude to Lord Ednam for having joined the members of the Institute on the occasion of their annual dinner and for having made so eloquent and witty a speech. It was a very fine thing, he said, that men occupying such positions as Lord Ednam occupied should take so deep an interest in the essentials appertaining to the welfare of the nation. The President mentioned that, as a very young man, he had accepted a position with the Coalbrookdale Company, and that company, in common with Lord Ednam's ancestor, were pioneers in the iron trade. Two names, which appeared inevitably on the first few pages of any text-book concerning the iron industry, were Dud Dudley and Abraham Derby. The President added that he had also been connected with, perhaps, the most famous iron-works in Scotland, *i.e.*, the Carron Company's works. The Coalbrookdale Company's foundry, if not the most famous in England, was certainly the oldest, because on their letter paper it was stated that it was 300 years old, and in the old part of the works there were beams dating as far back as 1609. The company had carried out their business in a manner which did credit to all concerned.

Thirty-Five Categories.

Enlarging upon Sir Gilbert Vyle's remarks concerning the democratic character of the Institute, he said that the Institute welcomed within its membership all concerned with the trade, including the suppliers of raw material and appliances. That was proof of the Institute's broadmindedness. The Institute's policy was that everyone connected with the foundry trade should know as much as possible about the technical difficulties and the methods of the trade, so that they might unite in their endeavours to produce all that the engineer required. The democratic constitution of the Institute was demonstrated by the fact that the membership comprised 35 categories of members. Further, the whole of the service rendered to the Institute was voluntary. In spite of that fact, the Scottish Branch was the second strongest in the Institute. (Laughter.) A Scottish member, bearing the good old Scottish name of "Cameron"—(applause)—had been awarded the Oliver Stubbs Gold Medal that day. This was the third occasion on which Scotsmen had made an application for this Medal, and it had been granted every time; the reason was, that the Council felt it was the best way to avoid trouble. (Laughter.) There were many Englishmen, however, who deserved the honour, and he hoped that, although he himself was a Scotsman, the Medal would be awarded to an Englishman next year. The President also congratulated Mr. Wesley Lambert (Past-President) on having been honoured by the award of the C.B.E. (Applause.) This honour had been conferred upon him largely through the active efforts of a Birmingham Member of Parliament, Mr. Longden, and the Foreign Secretary, Mr. Arthur Henderson. Mr. Longden was connected with the foundry trade, and his brothers were intimately connected with the Institute of British Foundrymen. Mr. Henderson was the only person in the present Government who seemed to have any idea of carrying out his job in a proper manner. Probably that was explained by the fact that he was an ex-moulder; anyone who made castings well could claim intelligence above the ordinary, and the duties of Foreign Secretary were simple by comparison. (Laughter.)

The President expressed gratitude to the Lord Mayor and Lady Mayoress of Birmingham for their personal interest in the convention, and also to the local employers who had given their active support to the Convention Committee and had made it possible for such excellent arrangements to be made for the instruction and enjoyment of those attending. One heard a great deal about the shortcomings of employers, but the President expressed the opinion that the British employer was the finest employer in the world. He might have his shortcomings, but he was doing his utmost to revive the trade of this country, which was desired so much by all. The Institute of British Foundrymen was working towards the same end. It was definitely trying to raise

the character of the personnel in the foundry trade, and to make it more intelligent, for it was of the utmost importance that this basic or key industry should be carried on by men of the highest technical qualifications. It was the ambition of the Institute that before many years had passed, the foundry industry would be so manned that it would be worthy to rank with the great engineering industry of this country. He did not discuss industrial economics, beyond repeating the statement made by Sir Hugh Ball, to the effect that we must save wisely and spend productively. That was about the wisest remark that had been made with regard to industrial economics during the past ten years.

Future Prospects.

Finally, the President deprecated the pessimism which seemed to affect some of the middle-aged and elderly, and declared his faith in the coming generation of this country. After all, there was encouragement to be derived from the fact that our technical schools were full of earnest students requiring the best knowledge available, and the universities were turning to the training of their students for industry. It was his belief that the junior would solve many of the problems facing us to-day, and if they were given the opportunity and the privilege they would make this old country once again the leader of the industrial world.

The Guests.

MR. F. J. HEMMING (President, Birmingham, Coventry and West Midlands Branch) proposed a toast to the guests. In the first place, he congratulated the President, on behalf of the Branch, upon his election to office, and thanked him for the tremendous amount of work he had done to ensure the success of the convention. In thanking others who had done so much to ensure the success of the gathering he mentioned particularly Mr. F. K. Neath (Hon. Conference Secretary and Treasurer) and Mr. F. H. Hurren, who, as Joint Hon. Secretary, had been responsible for the arrangements made for the interest and entertainment of the members at Coventry on the following day.

Of the distinguished guests present, Mr. Hemming paid tributes and expressed gratitude to the Lord Mayor and Lady Mayoress, Lord Ednam and Sir Gilbert Vyle. Of the visitors from abroad, he mentioned Dr. Ing. G. Vanzetti and Mr. F. W. Hobbs, of the Standard Brass Company, Benoni, Transvaal, and he expressed the hope that in the future delegates from abroad would attend the Institute's conferences in increasing numbers. Again, he thanked the Presidents of the various allied associations for having been present, as well as Dr. D. S. Anderson, the Principal of the Birmingham Central Technical College.

Coupling with the toast the name of Sir Herbert Austin, he said it would be difficult to tell the members of the Institute anything they did not know already concerning the wonderful romance of the development of Sir Herbert's works at Longbridge. He employed about 12,500 men, which meant that about 50,000 people were dependent for their livelihood upon the Austin Company. Industrial romances such as these were the backbone of the nation. It was interesting to note that Austin cars were used even in America in no mean quantities.

The Metamorphosis.

SIR HERBERT AUSTIN, responding to the toast, expressed the guests' appreciation of the hospitality and kindness extended to them by the Institute, and took the opportunity to discuss matters concerning the foundry business. He expressed an opinion which, he said, was perhaps not generally understood; it was that no part of the engineering industry had been so neglected as had foundry work in the past. In the old days, and even to-day in many cases, anything had been considered good enough for the foundry; any old corner, any kind of cover, usually full of holes—containing even more holes than the castings made there (laughter)—was considered good enough for the men who made the moulds and the castings. Long ago the time had arrived when the foundryman should receive more consideration. He believed we were on the point of effecting considerable improvements in the conditions of the foundry, in the type of work and the manner in which that work was done, and he believed we should see even greater progress in foundry work than we had seen and are seeing on the strictly engineering side. Enormous losses had been incurred in the past by reason of the fact that the foundrymen had not the necessary facilities and equipment to enable them to produce good castings; due to that fact, a great many bad castings had been made, the defects being discovered only after they had been machined.

Mechanisation.

Sir Herbert then went on to refer to the mechanisation of the foundry at the Austin Company's works at Longbridge. Members of the Institute had visited the foundry that day, but he could have wished that the visit had been postponed for a couple of months, because the process of mechanisation—which had to be carried on slowly because production must be maintained whilst the change was being made—was not yet complete. Every endeavour was being made to eliminate waste effort, and he hoped that when the change was complete there would be no waste castings.

The Open-Door Policy.

The change which he believed would take place in the foundry trade would not be effected very simply and very cheaply. It would cost quite a lot of money to mechanise and to put into good order the foundries throughout the country, but the change was long overdue, and, whatever it cost, he hoped that those in authority would be liberal and would give the foundryman the chance he had been waiting for, one might almost say, for centuries. (Applause.) To give an idea of the situation, he said his company had thought, some two or three years ago, that they had quite a model foundry at Longbridge; they had been rather proud of some of the things that were done there, and believed they had made the best steel castings in the country. But when they had looked into the matter carefully—because they had found from their records that the proportion of scrap and the cost per lb. of various types of castings were considerably greater than those experienced by others, as shown by the records of those other companies—they had realised that the foundry was not what it should be. Therefore, the advice of experts was sought, and considerable reorganisation was decided upon. The cost of that reorganisation in the foundry alone would be between £50,000 and £75,000. He believed we were on the eve of a proper appreciation of the foundryman's needs, and he hoped that those concerned with foundries up and down the country would recognise that they had got to make this step forward, that it must be done now if they were to succeed in business, and that it must not be done meanly. He believed that if the foundries distributed throughout the country, as part and parcel of engineering organisations, did not take advantage of the facilities now being offered, the foundry work in this country would go into the hands of specialists, *i.e.*, it would leave the engineering shops and would be done by men who realised what could be accomplished. Sir Herbert said he had already extended an invitation to those who had visited the foundry at Longbridge that afternoon to visit it again a few months hence, when the reorganisation was completed, and he assured them facilities for a proper inspection. His company believed in the policy of the open door from the beginning, and welcomed visits from members of interested bodies, because they believed that by means of such visits each could help the other to make the nation more prosperous. There were very serious difficulties before us at the present time, and he was afraid they could not decrease in the immediate future, but that during the next year, at any rate, industry would have to face quite a large amount of difficulty. But our task of reducing unemployment would be almost impossible unless there were some change of Government, or, at any rate, some change in the ways and means by which the country was being governed, whatever Party was in power.

The speeches having been concluded, the guests indulged in dancing until the early hours of the morning.

Institute of British Foundrymen.

(*Continued from page* 428.)

mingham; J. W. Gardom, Dunstable; J. T. Goodwin, Past-President, Chesterfield; Dr. R. H. Greaves, Woolwich; H. Greenhouse, Birmingham; J. F. Greenway, Birmingham; R. Greenwood, Manchester; J. T. Greenway, Birmingham; C. Gresty, Monkseaton; A. G. Griffiths, Birmingham; W. T. Griffiths, London; C. Guest, Northampton; C. Gutteridge, Coventry.

R. Haines, Rugby; R. L. Hamilton, Leven, Fife; R. R. Hargraves, Manchester; A. Hares, Bristol; A. Harley, President, Coventry; F. A. Harper, Stockton-on-Tees; W. E. Harper, Brierley Hill; F. P. F. Hayward, Birmingham; L. Hearnshaw, Brimington; C. Heggie, Birmingham; H. C. Heggie, Birmingham; F. J. Hemming, Walsall; G. E. Hider, Torquay; B. Hird, Newport; J. Hogg, Burnley; A. Holmes, Loughborough; L. Holt, London; E. J. L. Howard, Manchester; C. A. Howe, Somerset; R. E. Hoy, Hull; F. Hudson, Birmingham; L. B. Hunt, Luton; F. H. Hurren, Joint Honorary Convention Secretary, Coventry; J. E. Hurst, Chesterfield; J. R. Hyde, Stoke-on-Trent.

Dr. D. H. Ingall, London; S. L. Ireland, Birmingham; J. B. Johnson, Tipton; W. Jolley, Manchester; T. W. Jopling, West Hartlepool; C. H. Kain, Braintree; C. W. Kent, Coventry; E. G. King, London; H. E. King, Nottingham; A. D. Kirby, Leven, Fife.

J. Laing, Bedford; W. B. Lake, Honorary Treasurer, Braintree; Wesley Lambert, Past-President, London; W. T. Laverton, Stoke-on-Trent; E. J. Lewis, West Bromwich; J. E. O. Little, Doncaster; H. W. Lockwood, London; A. Logan, Newcastle; A. Lomas, Sheffield; E. Longden, Manchester; J. Lucas, Loughborough; G. T. Lunt, Darlaston.

T. Makemson, General Secretary, Manchester; J. Masters, Shrewsbury; R. A. Miles, Manchester; H. Milner, Manchester; D. M. Moir, Edgbaston; T. Mole, Wednesbury; H. H. Moore, Loughborough; W. H. Moore, Birmingham; T. H. Moorwood, Sheffield; G. Moran, West Bromwich; E. S. Morgan, Birmingham; E. Morgan, Birmingham; W. G. Morgan, Coventry; J. McArthur, Motherwell; J. J. McClelland, Newport; F. E. McGrah, Wolverhampton; J. McLachlan, Manchester; N. McManus, Giffnock; H. McNair, Consett.

F. K. Neath, Joint Honorary Convention Secretary and Treasurer, Birmingham; A. H. Newsum, Birmingham; Dr. A. L. Norbury, Birmingham; Hon. J. M. W. North, Chesterfield; W. O'Keefe, Birmingham; W. Olsen, Hull; C A. Otto, Manchester.

J. F. Paige, Birmingham; J. C. Palmer, Eastleigh; F. C. Pearce, Coventry; J. G. Pearce, Birmingham; H. Pemberton, Derby; H. Phillips, Wednesbury; J. Picken, Shropshire; C. D. Pollard, Sheffield; J. S. G. Primrose, Manchester; C. B. Pugh, Walsall; R. A. Pugh, Walsall; E. W. Pugh, Walsall; W. Pyatt, Leicester.

(*Concluded on page* 444.)

An Italian Sand-Preparing Plant.

By Jas. Cunningham, Wh. Sch.

For several decades there has been increasing progress in the direction of the introduction of systematic and regular methods of operation in many branches of industry, with the object of securing at the same time maximum output and the highest quality. These methods have tended largely towards mechanisation, which facilitates the maintenance of uniform and standard conditions, and one of the outstanding features of recent times has been the extent to which

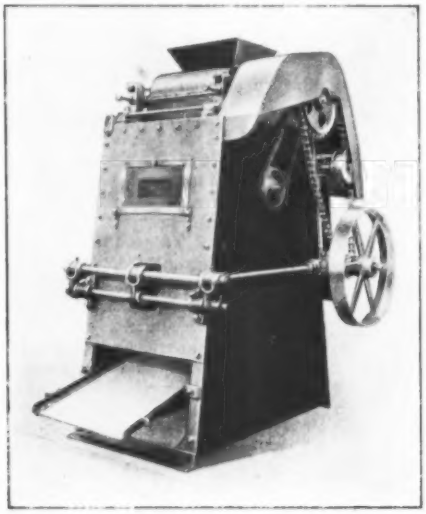


Fig. 1.—Sand-Cleaning Machine, by the Stabilimenti Tema, Turin.

they have become more generally employed in foundries.

In striving to attain this twofold end, the importance of eliminating defects in manufacture has been brought into proper perspective, since it is only the saleable output which is of any real value; all else simply adds to the cost of production and reduces that profit, the earning of which is the ultimate aim of commercial

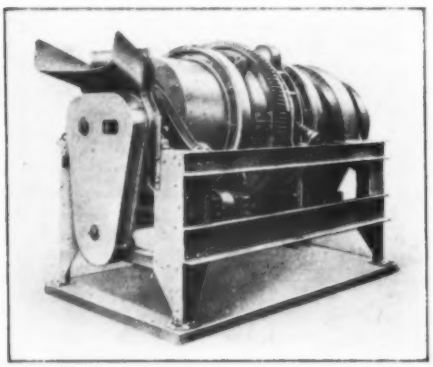


Fig. 2.—Sand-Mixing, Mulling and Tempering Machine.

undertakings. This has concentrated attention on the causes of defects and the means of removing them, leading often to the adoption of procedure which at first sight appears unduly costly, but, by virtue of increasing the proportion of net (or saleable) to gross output, has proved of very definite advantage. Careful analysis of the faults encountered in the production of castings has shown that a very considerable proportion, sometimes placed as high as 95 per cent., are due to some failure in regard to the moulding sand.

Even where the highest grades of moulding sands are readily available, the used sand cannot economically be simply discarded, and it is actually in such locations that the reclamation of moulding and core sands, so that they can be satisfactorily combined with fresh material, received its early and most active impetus. It is not surprising, therefore, that attention is everywhere being turned to the solution of the problems connected with the preparation of sand, since this may well be regarded as the heart of the foundry.

The notices recently circulated about the International Foundry Exhibition and Congress, to be held at Milan in the autumn, have turned the thoughts of foundrymen to Italy, and it will no doubt be of general interest to note the lines along which the Stabilimenti Tema, of Turin, have sought to solve the double problem of satisfactory treatment of sand and of constructing machines to permit this to be carried out continuously and regularly. With these objects in view, they decided to combine in a few simple and reliable machines the various operations which are frequently carried out in a disjointed manner, either by hand or by the use of a number of separate machines, often mechanically imperfect, with capacities out of balance with those of the others, and giving very variable results in working. These machines of the Tema Works, for particulars of which the writer is indebted to the Steel Band Conveyor Company, of Birmingham, have been designed to give the most perfect execution of the individual operations with maximum and continuous operation, each stage being closely bound up with the others.

The first machine, shown in Fig. 1, serves for cleaning the sand, including the following operations:—(1) Crushing the lumps, (2) electro-magnetic separation and (3) riddling or sifting. This simple machine, the parts of which are strong and free from complication, consists of two crushing rolls, fitted with compressed springs which permit a certain freedom of movement, serves to break down all lumps of sand passing through it, the rolls opening out when required, so that pieces of metal or other hard

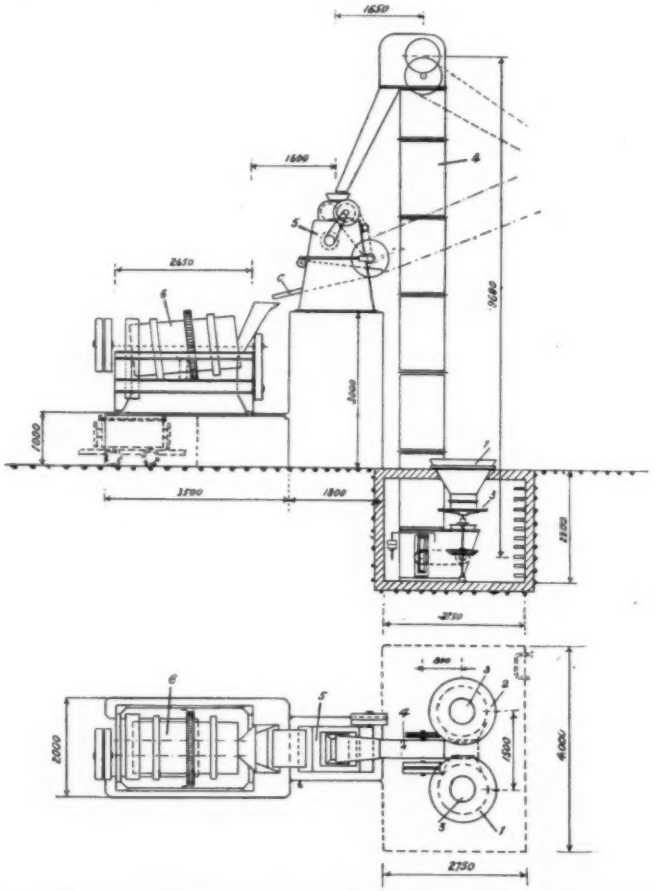


Fig. 3.—General Arrangement of Sand-Treating Plant Embodying the Machines shown in Figs. 1 and 2.

(1) Used-sand hopper; (2) New-sand hopper; (3) Rotating, feeding and proportioning plate; (4) Bucket elevator; (5) Continuous sand-cleaning machine; and (6) Continuous tempering and mixing mill.

substances contained in the used sand can pass through. Immediately below these rollers there is an electro-magnetic separating drum of sufficient capacity to remove all the iron and steel pieces, such as nails, spikes, etc., contained in the foundry sand, which, if not thoroughly eliminated, are so great a source of surface and other defects in castings. The sand, freed from all such materials, then falls on to a high-speed vibrating sieve, which removes all other impurities of a non-magnetic nature, such as waste, pieces of wood, etc. At the end of this operation the sand is now thoroughly cleaned, separated from all foreign materials and ready to be mulled, mixed and tempered prior to being returned into service.

This further most important series of operations is carried out in the second machine, shown in Fig. 2, which includes the following

(*Concluded on page* 440.)

The Foundries of the Daimler Company.

IRON, STEEL AND NON-FERROUS CASTINGS MANUFACTURE UNDER ONE ROOF.

The management of the Daimler Foundry at Coventry represents to our mind one of the most difficult problems of organisation we have ever encountered. This is due to the following desiderata:—It is one of the oldest automobile foundries in Great Britain, yet one of the largest foundry shops, being airy and well lit. It is called upon to manufacture both in large and small quantities iron, steel, non-ferrous and light-alloy castings, for consumption, both internal and external, and, like other automobile foundries, it is subject to violent fluctuations in demand.

Naturally, a number of interesting problems have to be solved, such as whether there should be centralisation of sand preparing, core-making and fettling, or whether these should be separated and departmentalised. Actually, the management is favouring decentralisation of sand preparing and core-making, whilst maintaining the finishing department as a single unit. Thus the present position is that, with the exception of the chemical, physical and mechanical testing laboratories, the pattern shop and stores, the fettling and heat-treatment sections, the balance of work is all carried out in one large shop, measuring 580 ft. by 180 ft. An outline drawing of the shop is shown in Fig. 1.

Raw Materials.

The foundry is well served by sidings connected with the Coventry—Nuneaton branch line, and raw materials can enter on three sides of the building. Moreover, the works is intersected by roads, superior to the average large provincial towns, which greatly facilitate motor transport.

Whilst the foundry is well placed for the entrance of raw materials, the arrangements for dealing with despatch of foundry waste are, again, admirable. All waste sand and slag are dumped into a hopper, situated almost centrally, but rather nearer to the steel-foundry end, which is productive of the most waste. Here it is taken by an apron conveyor up a height to discharge into a bin placed over a truck on the siding. The arrangement, shown in Fig. 2, is well worth emulation by quite a number of foundries we have visited.

Quality Control.

Daimler products are admitted of the highest grade, and everything is sacrificed to quality. Thus, on arrival, the pig-iron, coke and sands are carefully sampled, analysed and tested in various ways, and no outside scrap is ever incorporated into any mixture, be it iron, steel or

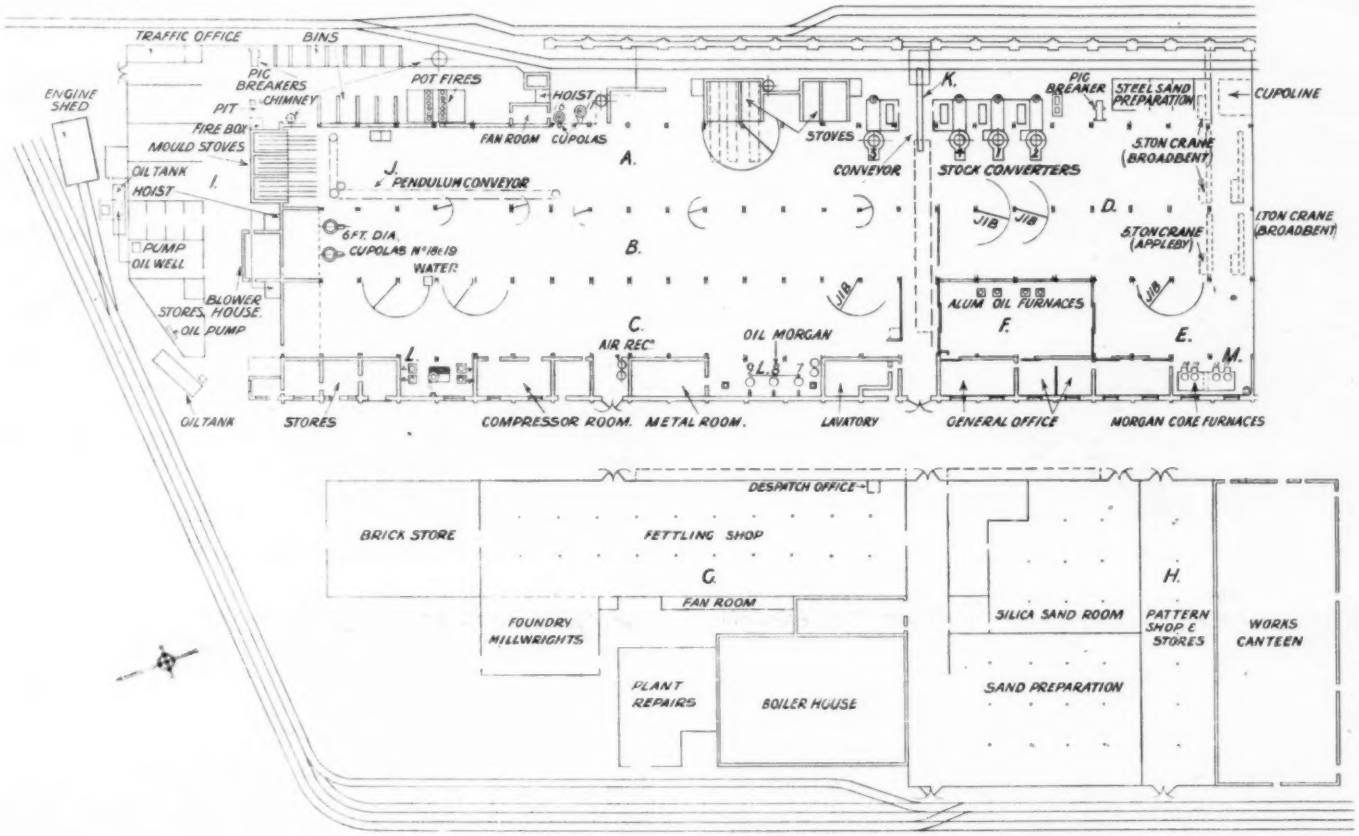


FIG. 1.—THE GENERAL LAY-OUT OF THE FOUNDRY OF THE DAIMLER COMPANY, LIMITED.

A is the cast-iron section devoted to moulding; B, grey-iron section for assembling and casting; C, light-alloy section; D, steel section; E, brass section; F, die-casting shop; G, fettling shop; H, pattern shop; I, raw material stores; J, pendulum conveyor; K, rubbish conveyor; L, furnaces for light alloys; and M, brass-melting furnaces.

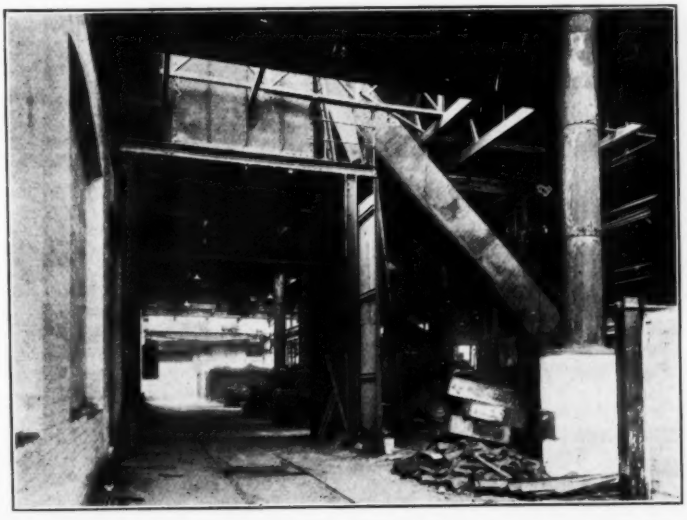


FIG. 2.—RUBBISH CONVEYOR AND HOPPER (K, FIG. 1).

non-ferrous. So far as sand testing is concerned, we were just a little sorry to see that internal standards were being developed and used. Obviously, the management has acquired, and is utilising, data which are difficult of appreciation. The chemical laboratory, a general view of which is shown in Fig. 3, is extremely well equipped, and, in addition to its work of controlling the quality of the metal used in the foundry, undertakes the analysis of oils, fats and greases, and wrought materials used in the construction of motor cars. It is the centre of a number of ancillary departments, such as pyrometry, micrography and photography.

Across the corridor is a well-equipped mechanical-testing department (Fig. 4), containing, *inter alia*, two standard Olsen tensile machines, one Dennison tensile and transverse machine, an Avery impact tester, and also Brinell, Rockwell and Vickers hardness testers. Here it seems useful to interpolate the fact that the works has a special department containing more than a dozen Brinell machines, which check the relative machinability of all consignments of material entering the machine shops.

Fig. 3.—Chemical Laboratory.

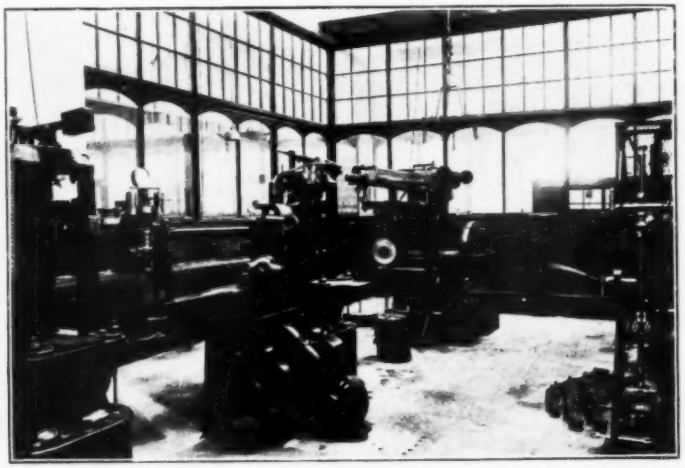


Fig. 4.—The Mechanical-Testing Laboratory.

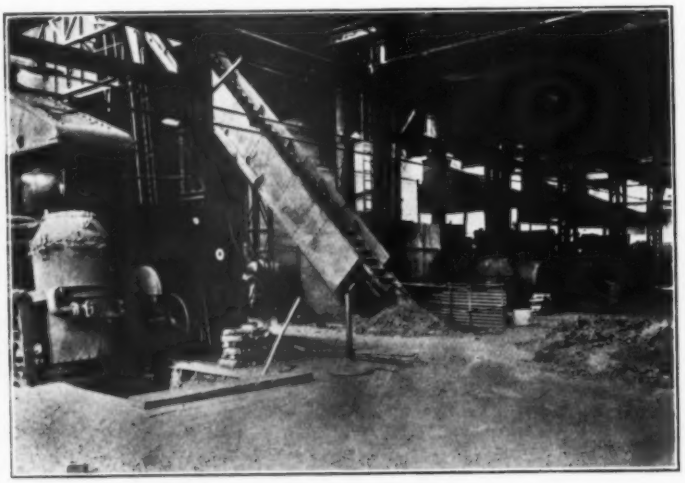


Fig. 5.—The Stock-Converter Steel-Melting Plant and Rubbish Conveyor (D and K, Fig. 1).

Fig. 6.—Air-Cooled Cylinder Section, showing Moulding Machines and Pendulum Conveyor (A and J, Fig. 1).

Melting Plant.

Iron Foundry Department.—Because of the fluctuations in demand, previously referred to, a heavy reserve of melting capacity is kept in all departments, and especially in the iron foundry. Under normal conditions, two drop-bottom cupolas of 3 ft. 6 in. and 4 ft. 6 in. shell dia., each carrying 4 circular tuyeres, can supply the demand, but during a trade boom there are two 6-ft. shell dia. cupolas lined down to 38 in., which can be brought into action. Material is taken to the charging floors by electric lift, and, as is common in automobile-foundry practice, quite small charges are used, the pigs being broken by a "Green" breaker. It is quite common to use three or four mixtures during an afternoon's run, and a technique for the separation has been established which does guarantee the production of metal to predetermined analyses. The iron is caught in a mixing ladle which is used as a reservoir for supplying hand shanks.

We never remember seeing such care taken for the segregation of different mixes of over-metal. A bank of chill moulds is provided, and as soon as, say, the cylinder mixture is finished, a bar is inserted at the side of the last chill mould to be filled with over-metal. Then, similarly, on the exhaustion of the next mix to be melted, a second bar is inserted, and so on. By such strict segregation and classification of scrap and the complete exclusion of "bought" scrap, the composition of the various classes of castings can be controlled to within exceedingly fine limits.

The Steel Foundry.—The Daimler foundry is one of the few works which operate the Stock converter process. It will be remembered that this method, whilst conserving Bessemer's pneumatic process, eliminates the cupola as a supplier of molten metal by utilising the vessel itself as a melting furnace, employing oil as fuel. There are four furnaces of 1,200 lbs. capacity, which are situated at the side of the end of the foundry opposite to the big cupolas, as indicated in Fig. 1. Their general appearance is shown in Fig. 5. The converters are lined with Cupoline, and special plant has been installed for their confection. An average melt takes 1½ hrs. and the time for conversion is 20 min. The process undoubtedly gives exceedingly hot metal, which, when poured into green-sand moulds just skin-dried, yields sound castings. The facilities offered by this section of the Daimler works are such that they are used and appreciated by many of the best-known makers of motor lorries and omnibuses.

The Brass Foundry.—For the "brass" foundry there has been provided a battery of four coke-fired Morgan 400-lbs. tilting crucibles. These give an elasticity of output capable of meeting adequately the varied nature of the requirements of a foundry catering for every branch of the automobile industry, together with those of the maintenance department of an extremely large engineering factory.

The Light-Alloy Section.—Here, too, Morgan furnaces are used for melting; in this case the installation comprises three 400-lbs. (brass capacity) oil-fired tilting furnaces, and one coke-fired. A 400-lbs. aluminium melting furnace, of the Pneulec type, is installed in this section. The relative position of the brass and light-alloy foundries is shown in Fig. 1. The most interesting furnace in the light-alloy department is one designed by the Daimler

foundry staff. There are seven of these furnaces in use. It consists of a rectangular casing lined with firebrick to 24 in. dia. A 180-lb. circular melting pot, made from semi-steel cast-iron, is set centrally in this cavity. It is fired by oil fuel, and a baffle surrounds the pot. To increase the life of the pot it is coated on the inside with a mixture of plumbago and whiting, and it can be relied upon to withstand 80 heats, in spite of the fact that the average thickness of the pot is only $\frac{1}{2}$ to $\frac{5}{8}$ in.

Core Making.

Only recently, the management decided to decentralise this particular activity, and now each department has its own coremaking section. Silica sand for cores has been employed at the Daimler foundry for nearly 20 years, and their own mixture has been developed incorporating molasses, linseed oil and resin, the proportions being varied according to the type of core required. The use of proprietary brands of core oil has, so far, been limited to experimental work only. The heavier cores are baked overnight in simple coke-fired stoves of the slow-burning variety. The technique has been so arranged that, after lighting, no further stoking is required during the night, yet the cores are in perfect condition in the morning. In other sections of the foundry are batteries of the usual type of Tortoise gas-fired stoves, which take care of the smaller variety of cores. Sand preparation, too, is now in the course of being decentralised.

Moulding.

As a well-known make of moulding machine was invented in this particular foundry, it is only natural that, so far as possible, it has been made standard. This machine, of which there are 67 installed in operation, is of the pneumatic-jarring variety. In addition there are 17 hand-ram stripping machines. Sand is brought to the machines in large containers, no conveyors being used, because of the variety of production. Naturally, having to manufacture iron, steel, and a large variety of non-ferrous castings under the same roof, forces the management to take cognisance of a common means of transport for each section, if a maximum of economy is to be assured. In the air-cooled cylinder section a certain amount of mechanisation has been introduced, as is shown in Figs. 6 and 7. Moulds for B.S.A. cycles are made on stripping-plate machines and are placed on a three-tier Morris pendulum conveyor, which carries them to the drying stoves. These have been supplied by August's Muffle Furnaces. Each of the three stoves has a floor space of 18 ft. by 10 ft. 7 in., and they are separated by a 14-in. wall. Each stove takes four carriages, three tiers high, and a full charge is dried in 7 hrs., gas coke being used as the fuel. After drying, the conveyor returns the moulds to the centre bay for coring up and closing.

Fettling and Finishing.

All castings, from no matter what section, leave the foundry to be fettled and despatched to the appropriate department. Immediately on arrival they are subjected to a rigorous inspection, and whilst it is incorrect to say that no welding of defects takes place, it is no exaggeration to designate this operation as being insignificant when the size of the foundry is considered, for when trading conditions are good it employs some 450 men.

Tilghman's sand-blast rooms, of which no less than four are installed, tackle the major portion of the castings, but many of the smaller ones are put through sand-blast cabinets and tumbling barrels. A battery of double-ended grinders, properly provided with dust-extracting devices, is installed on the opposite side of the shop, which is shown in Figs. 8 and 9, to the sand-blast machines. The final exhaust of the dust from this shop is carried to settling tanks outside the building.

Pattern Shop.

The pattern shop attached to the foundry

(*Concluded on page* 438.)

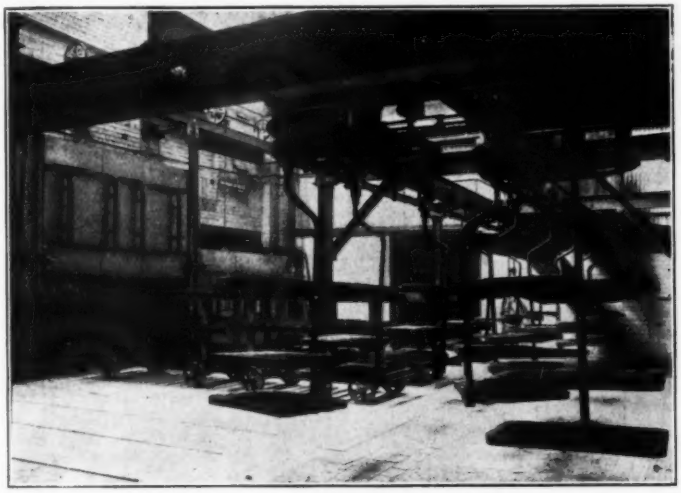


FIG. 7.—AIR-COOLED CYLINDER SECTION, SHOWING DRYING STOVES AND PENDULUM CONVEYOR (J, FIG. 1).

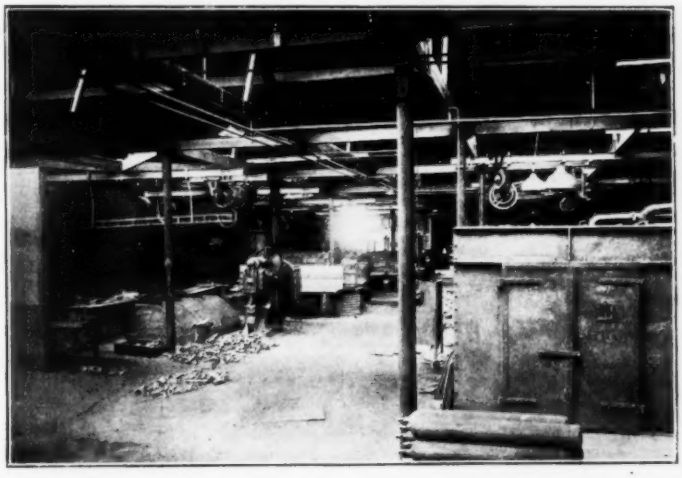


FIG. 8.—PART OF THE FETTLING SHOP, SHOWING SPRUE-CUTTING MACHINE AND DOUBLE-ENDED GRINDERS (G, FIG. 1).

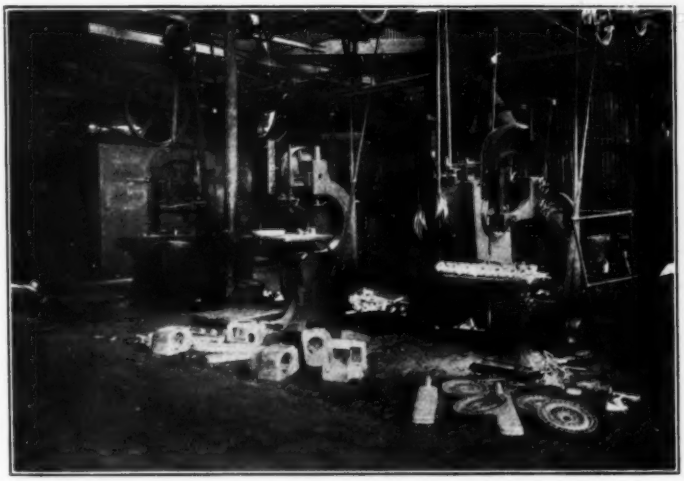


FIG. 9.—ANOTHER SECTION OF THE FETTLING SHOP, SHOWING BAND SAWS FOR CUTTING OFF RUNNERS.

FIG. 10.—ELECTRICALLY-HEATED FURNACES FOR HEAT-TREATING LIGHT-ALLOY CASTINGS.

Recent Developments in Cast Iron and Foundry Practice in Great Britain.*

By J. G. Pearce, M.Sc., M.I.E.E.

(DIRECTOR, BRITISH CAST IRON RESEARCH ASSOCIATION.)

[*In this Paper, a few contributions made by the British Cast Iron Research Association to the study of cast iron and foundry practice during the last few years are reviewed. In particular the Paper deals with the recommended practice of the Association for the control of foundry moulding sands; with improvements in cupola melting; and with some considerations arising out of the study of cast iron itself, including the development of a new series of growth- and scale-resisting irons. The Association aims at gaining the support of all production foundries, so that it may be fully representative of the industry, charged with the task of improving quality and cheapening production, and of serving the industry as a whole, free from any sectional or commercial interest. It is hoped that this record of work, often done under circumstances of great difficulty, will indicate what might be accomplished under more favourable conditions in the enormous field still awaiting attention.*]

It is particularly appropriate that, in the city in which this Institute was founded and in which such a closely-associated body as the British Cast Iron Research Association has its headquarters, the author should pass in review the work of the Association since its inception. At the present time it is at a very critical stage of its history. It has hitherto been able to carry on its work by virtue of a grant received from His Majesty's Government equal to subscriptions received from the industry. After the present month, June, 1931, it is necessary for the Association to double its income from the industry in order to earn the same grant; on the present subscription no grant will in future be paid at all. The Council of the Association is satisfied that the additional income is not only desirable, but essential if the demands made by the industry on the Association are to be met. Since it has hitherto enrolled only some 15 per cent. of the foundries which could profit from membership, the additional income necessary could readily be raised if a similar 15 per cent. were to indicate their intention of subscribing. There is no need at this date to reiterate the need for research work in cast iron and foundry practice. The great strides made by foreign rivals in this field cannot be ignored, and every poor casting that gets into the machine- or finishing-shops is a source of loss and waste far beyond the cost of the casting itself. Should it get into service, a failure seriously prejudices not only the founder concerned, but the whole industry, and affects the status of the material in the eyes of the user.

When the author assumed responsibility in 1924 for the work of the Association, the suggestion was made that if it were to publish something of technical value to the industry the support required would be more readily forthcoming. There has, in fact, since that date, been a steady increase in membership, and hence of income, and it is hoped that a statement of the work done to date will assist in the present contingency. This Paper thus may serve the double purpose of rendering account of work done during the past seven years and of stating a case for a wider measure of support, without which its activities must cease. It will necessarily be brief and in the main based on contributions to the development of cast iron and the art of founding made by the Association and presented to technical institutions. During the past four years these exceed a score in number, excluding articles in the technical Press. While the Council is under no obligation to present any part of the work of the Association to the industry as a whole, it takes a broad view of the functions of the Association as a national and public body.

It will be evident that this review can only deal in part with the Association's work. Every day it is called upon to answer inquiries from members and others at home and abroad, calling into play the resources of the Library and Information Bureau, which is now the finest collection of information on founding in the world. The Bureau is responsible for the quarterly Bulletin which abstracts all papers and publications, including Patents, relating to the industry from British and foreign sources, and a good deal of material has to be translated in order to provide this service. It keeps members in touch with foreign developments whether on processes or materials. Proprietary materials and Patented processes are, by arrangement with those concerned, reported on impartially, generally after personal investigation.

MR. J. G. PEARCE, M.Sc., M.I.E.E.

The Association also deals on a confidential basis with inquiries from members who are in difficulty with foundry methods, assists members in the application to current practice of recent scientific advances and shares in the development of new plant, processes, etc. Furthermore, a comprehensive research programme is undertaken at the headquarters laboratory in Birmingham, at Sheffield and at Falkirk, the well-known centre of the light castings industry. The Research Reports issued to members have now reached a hundred and appear at irregular intervals when the work is ready for reporting, on an average about once every three weeks. In addition, the Association represents the technical side of the industry on many official committees (some thirty in number), and is frequently called upon to take part in discussions relating to standardisation which concern the whole industry. Throughout it acts in the interests of the industry.

The Association's field of work is the founding industry, its raw materials, its methods and processes and its plant and equipment. In order to reduce this review to measurable proportions it is proposed to consider three main points likely to be of general interest; moulding sands, the cupola melting furnace and the properties of cast iron itself.

Moulding Sands.

The work on moulding sands can be discussed very briefly, because a separate Paper is being given on this subject[1] by Dr. J. G. A. Skerl, who, in the laboratory of the Department of Refractory Materials, University of Sheffield (Mr. W. J. Rees, B.Sc., F.I.C.), has been responsible for the work carried out by the Association. Moulding sands form a most important raw material of the foundry, and it is estimated that the aggregate cost of sands and refractories to the trade is at least a million sterling per annum. The saving of a fraction of this cost, both in raw material and in transport charges, is, therefore, a matter of very great importance. Other countries—not so blessed with good natural and easily-available moulding sands—were forced to begin systematic tests at an earlier date, but there is no doubt that the special character and variety of British sands demands a British approach. The first step taken was to devise a set of tests which can be used to determine those properties of moulding sand which are important to the founder. It was essential that comparable results should be obtained between different sands and on the same sand at different stages of its life, with differing moisture contents, ramming densities and so on. The report prepared under the direction of the Sands and Refractories Sub-Committee was circulated in printed form in May, 1930 (after the methods had been tested over a period of several years), and the Council decided to make this available to any interested persons at a small charge,[2] in view of the importance of the common use of the same apparatus.

For research work on moulding sands, the whole of the tests outlined in this report are necessary, but for the purposes of daily foundry control, two tests only are needed, a strength and a permeability test. Simple apparatus was designed for the purpose of making these two tests, and is available to all at a small charge from the suppliers approved by the Association.* The price of these two pieces of apparatus together is something like one-fourth of that required for corresponding American apparatus.

It is not possible for anybody to say for any given sand, what type of mixture, milling time, treatment, moisture content, etc., is required for the work of a particular foundry before considering the working conditions in the foundry. This advice can generally be given after detailed consideration of each case, and in adopting it sand users are recommended to take regular tests of strength and permeability and, after some experience, to fix upper and lower limits of both these figures between which the sand will give satisfactory service. Troubles and difficul-

* Paper read before the Birmingham Convention of the Institute of British Foundrymen.

1 SKERL, J. G. A., "Sands and Sand-Testing," Institute of British Foundrymen. Paper read at Birmingham Conference, June, 1931.

2 SKERL, J. G. A., and REES, W. J., "Methods of Testing for Foundry Moulding Sands." Research Report No. 73. Issued by the Association, May, 1930. (Temporarily out of print.)

* B.C.I.R.A. Permeability Apparatus (British Patent 327,306). Price £5, less 25 per cent. discount to B.C.I.R.A. members and approved technical institutions, from Samuel Platts, 6, Holly Street, Sheffield. B.C.I.R.A. Compression Apparatus. Price 70s., less 10 per cent. discount to members and approved technical institutions, from Geo. Salter & Company, Limited, West Bromwich.

ties can be correlated as time goes on with changes in the permeability or the strength of the sand. It is then possible gradually to diminish the amount of new sand added, and to work on the most economical mixture which the nature of the sands used and the work turned out permits. While some foundries work almost entirely without new sand, the majority, knowing from experience the troubles associated with poor sand, use more new sand than is strictly necessary in order to have a margin against trouble. By means of scientific sand control, this margin can be diminished. Change in sand supply also does not cause the difficulties often resulting from it in the ordinary way.

The Association has now applied the tests outlined in the above Report[2] to no less than seventeen representative sand deposits in Great Britain, the red sands of the Midlands, the yellow sands of the Thames estuary, the rotten rock sands of Scotland, and various other typical deposits. Over 90 per cent. of the castings made in Great Britain are made in sands of which these are types. The result is that a unique body of information has been collected which can be utilised through the Association's experts by any foundry in the country. This remark incidentally applies equally to steel and non-ferrous foundries as to grey and malleable iron foundries.

At the present time the Association is working on core sands and refractories for cupola linings and other furnaces. Facing-sand mixtures in the various foundry areas are being studied in the light of castings made, so that it will soon be possible for the founder to purchase core and moulding sands and refractories to a definite specification. It is estimated that the application to the industry as a whole of present knowledge of sands and refractories would result in savings of at least £100,000 per annum.

Melting Practice.

The Association has always consistently taken the view that the cupola is the heart of the foundry in which good raw material may be spoilt or the best use made of indifferent material. The temptation during the war to get from a particular size of cupola the maximum amount of metal per hour was considerable, and the rapid-melting type became very popular. This type, however, involves the supply of a greater volume of air than is necessary to burn the coke and melt the metal, the excess being consequently available for oxidation of the metal and the elements in it.

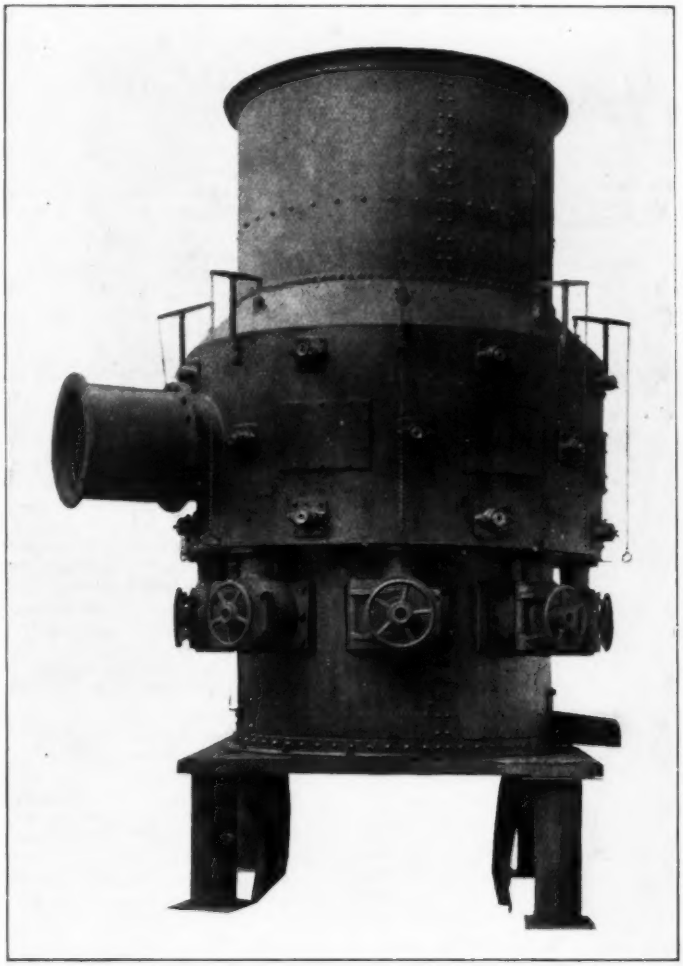


FIG. 1.—BOTTOM SECTION OF THE "BALANCED-BLAST" CUPOLA.

The Soft-Blast Cupola.

Under the guidance of Mr. J. E. Fletcher, the first step the Association took was to evolve a design of cupola which has since become known as the "soft-blast" type. The design naturally varies with the requirements of each particular foundry, but it is characterised by an ample height from tuyeres to charging hole, a generous wind-belt, a low air-pressure, a single row of tuyeres, rectangular in section and about twice as wide as they are deep and flared out towards the inside of the cupola, thus offering the least possible resistance to the admission of the air whilst giving efficient penetration of the coke bed. This type of cupola does not yield such a large output per hour as a corresponding size of the rapid-melting type, or, to put the same fact another way, a larger capital outlay is required on this type of cupola to produce a given output per hour. Ample evidence is available, however, to show that this is more than offset by the improvement in quality of the material made and diminution of losses and wasters. Several hundred cupolas have been remodelled on this basis and, in spite of the almost invariable necessity for making use of the existing blowing equipment, they are giving excellent service. The coke consumption, excluding the bed, is usually about 10 to 1 for engineering castings, and where scrap is light, runs are long, and composition suitable, as in light castings, 13 or 14 to 1. Since most foundries have melting plant in excess of requirements, the large majority of soft-blast cupolas at work are reconstructions of earlier designs.

The "Balanced-Blast" Cupola.

More recently Mr. Fletcher has evolved another type of cupola for which a British patent,* held by the Association, has been obtained, and foreign applications have been granted and are pending. This type is known as the "balanced-blast" cupola, and at the present time not more than a dozen of these cupolas are in operation, although they are spreading rapidly.

The Association was anxious to have definite proof in practice that the principle could be applied to all sizes of cupolas, types of charge, etc., and has hesitated to advance any claims until they have been fully substantiated. This cupola is supplied with a row of main tuyeres and two or more rows of smaller auxiliary tuyeres, all in and fed from the same wind belt. The particular feature of the cupola is that the main lowermost tuyeres are controlled by finely adjustable screw valves, so that the air admitted to these tuyeres may be regulated, the tuyere apertures between the valves and the cupola lining being designed so that, though the annular stream of air passing the valves is at a high velocity, the impinging effect on the coke is reduced so as to produce a softer blast. The bottom section for a 51-in. bore cupola is shown in Fig. 1, and the tuyere system (but not to scale) in Fig. 2. The construction permits the valve to swing aside in order to get at the tuyere if required, the valve stem being hollow so as to permit inspection and allow of temperatures, gas pressures and gas analyses in the coke bed to be taken if required. The upper tuyeres can also be inspected while the cupola is running.

It is obvious that for a given air supply pressure the throttling of the valves at the main tuyeres will result in an increase of pressure in the wind belt, and consequently the passage of more air through the upper tuyeres. Thus, a balance of air supply can be maintained between the main tuyeres and the upper tuyeres to suit the requirements of working. It is found that one particular setting of the main valves, readily obtained in practice, is suitable for a particular type of charge, size of scrap, type of coke, etc. Towards the end of the melt the necessary reduction of air supply can be obtained by a further throttling of the main valves. When the type of charge, size of scrap, type of coke, etc., is changed, a suitable alteration in the valve openings may be made to obtain the best results. The cupola, therefore, can be controlled by the foundryman to suit any melting conditions which may arise, and, after a little practice, it is found that, beyond the determining of the best valve position for the early part of the blow, no other valve adjustment is needed until, during the last half-hour or so of the blow, the valve openings may be further throttled. Provision is also made for clearing away slag obstruction from the mouth of any tuyere by means of a simple valve which can

* British Patent 333,322.

be made to cover the inlet to the main valve. After the obstruction has cleared, the de-slagging valve can be raised, and the main tuyere, thus cleared of slag, functions again. In Fig. 2 this valve is shown as a dish type. When the cupola is running, this is, of course, normally above its seat, and is only released when it is necessary to cut off the air supply while slag obstructions are melted away. The coke bed, of course, is somewhat heavier than with the soft blast type, on account of the extra rows of tuyeres, but the peculiar conditions of operation appear to result in a much less oxidising atmosphere inside the cupola, with the result that the bulk of the coke bed is recovered intact, a coke recovery of about 50 per cent. being normally expected and obtained.

In the original trials of this cupola the coke to 13, and even 16:1 (metal to coke ratios), during short runs of 2 to 3 hours. The metal temperatures indicated by the Cambridge optical pyrometer were 1,470, 1,430 and 1,460 deg. C. The coke-bed recovery was 50 per cent., the wear on the lining had diminished, and the drop was very clean. The advantage of the drop-bottom type, which is always advised, has been proved; the coke recovery being greater and the recovered coke clean enough for use in the future charges. The size and condition of the recovered coke is a clear testimony to the less oxidising character of the gases present in the coke bed during the blow.

In practice, the "balanced-blast" cupola has shown the advantage of being able to control the air supply over the entire depth of the coke bed. By this elastic control the whole of the

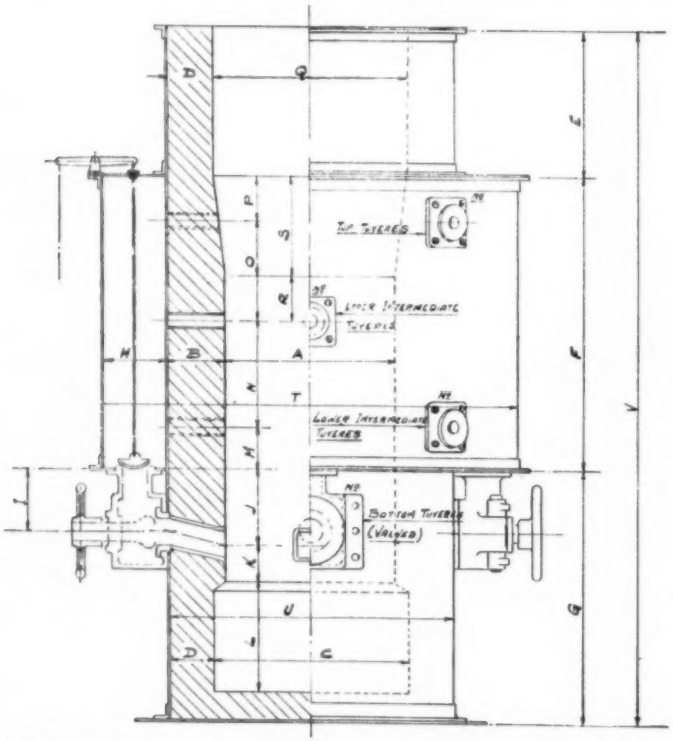


Fig. 2.—The Tuyere System of the "Balanced-Blast" Cupola (not to scale).

In each row of tuyeres, the tuyere position alternates with the row below or above.

consumption for a 54-in. bore furnace was gradually reduced to 5.6 per cent. (nearly 18:1). The metal temperature was excellent and uniform throughout the melts, being between 1,400 and 1,425 deg. C. Less patching is required, and the cupola is cleaner after the day's run than with an unaltered normal-type cupola. The melting rate was increased from the normal 10 tons to nearly 14 tons per hour. In the working of these particular 54-in. bore cupolas, the service results show that a coke saving of 33⅓ may be expected, and in some cases as much as 50 per cent. can be saved. The reduced coke consumption diminishes the sulphur pick-up.

The author recently saw in one day, these cupolas at four different foundries, the internal diameters being 54, 51, 30 and 24 in. respectively, and there is now no doubt of its applicability to any type of charge. Of the four cupolas, one was entirely new, and a second was a new furnace nearing completion. The others were reconstructed. The new completed furnace had just finished its first run, and the other two were seen in normal operation. One was running Silal heat-resisting iron, referred to later. The reports from users are typified by the works which has installed the 30-in. bore cupola, a reconstruction of an existing furnace. Here the coke economy has improved from 10:1 coke bed is maintained in an incandescent state at high temperature, thus acting as a thermal storage column for the prevention of variations in the casting temperature of the metal.

This has been proved in even the smallest cupola (24-in. bore), where, for reasons which do not concern the cupola, the blast has been shut off for intervals of as much as 30 minutes during a 2- to 2½-hour blow. The metal was quite fluid and satisfactory when tapped.

Further developments of the balanced-blast principle are in progress, in the direction of the remelting of metal charges containing high percentages of steel or other low carbon metal, with little or no carbon or sulphur pick-up, accompanied by a high casting temperature. It is estimated that the adoption of the balanced-blast cupola by the industry as a whole would result in an annual saving in coke on a very conservative estimate of at least £100,000 per annum, apart from the other advantages. With many foundries coke economy is of small importance, and metal quality is vital. In the author's view this design will give the cupola a new lease of life.

The author completes this section by quoting, with permission, from a letter recently received from a very well known and able foundryman. He stated that the "balanced-blast" cupola is "a masterpiece of practical ironfounding, which I believe to be the best now obtainable for ordinary foundry grey iron. I make this statement after a very detailed visit to works where these cupolas are in operation, with all results before me, confirmed by users of cupolas by rival makers. I think here you have made a forward move, indeed. Please accept these congratulations and believe me when I state that the Association has become a centre of practical intelligence which British ironfounders will find of incalculable benefit."

(To be concluded.)

The Foundries of the Daimler Company.

(Concluded from page 435.)

department is confined to the production of metal patterns and pattern plates. Unlike some departments of this character, it does not cast its own patterns, but a 400-lb. oil-fired Morgan furnace is kept in the foundry at its disposal. An adjoining shop is used as a pattern stores, and here one sees the ordered accumulation of patterns, representing the result of the annual change in design for the last 20 years. Yet destruction is out of the question, for high-grade cars like the Daimler have a habit of lasting for years, and service demands that an order for a spare part for a car, no matter how old, must be expeditiously supplied at a reasonable cost.

Heat-Treatment Department.

The high-tensile aluminium-alloy castings made in the foundry are heat-treated in this department. The plant (Fig. 10) consists of two electric-resisting furnaces, of 120 kw. capacity each, of the muffle type. As the heat-treatment requires a total time of 48 hrs., absolute accuracy in temperature control is essential. The temperature in these furnaces is automatically controlled to a high degree of accuracy by Cambridge scientific instruments, of the relay type. The effect of the heat-treatment on these special alloys is to increase the tensile strength from 10 to 18 tons per sq. in., with a consequent increase in Brinell hardness from 50 to 110. Every casting is tested for Brinell hardness after passing through this treatment. Two smaller furnaces, of the electric hot-air type, designed in the Daimler works, are also in constant use in this department, for ageing treatment of aluminium alloys.

Die Casting.

The die-casting department at the Daimler foundry is being steadily developed. Until recently it has been chiefly employed in the production of pistons and cylinder heads. The Daimler pistons are of special design for obviating expansion trouble. This department is self-contained, having its own metal stores, melting plant, cutting-off machinery and pyrometric installation.

The Daimler foundry is undoubtedly one of the most interesting industrial concerns in England, as it manufactures an infinite variety of castings in all metals and alloys in varying quantities, whilst manufacturing both for internal and external consumption. In thanking Mr. Harley and the staff for their kind co-operation in the preparation of this article, we congratulate them on the very intelligent manner they tackle a really difficult foundry problem.

Hints for Commercial Visitors to Finland.—A memorandum containing hints for the guidance of commercial visitors to Finland has been prepared from information received from the British Consul at Helsingfors. United Kingdom firms interested may obtain copies of the memorandum on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1, quoting No. C.3552.

XUM

The Commercial Application of "Silal."

The discussion on the Paper "The Effect of Carbon and Silicon on the Growth and Scaling of Cast Iron"* which was presented by Dr. Norbury and Mr. Morgan to the recent meeting of the Iron and Steel Institute, disclosed something of the potentialities and achievements of "Silal," the high-silicon iron developed by the British Cast Iron Research Association.

Relationship between Growth and Scaling.

The discussion was opened by SIR HAROLD CARPENTER, who said that the authors had been carrying out work during the last, he thought, three years, and they knew that their investigations had ben so successful that it had been possible to base on them certain patents of alloys which he had little doubt would be of very great industrial use. A particular indebtedness was due to the Council of the Cast Iron Research Association for giving the authors permission to publish their results in a scientific form.

With regard to the actual title of the Paper, he noticed that the authors referred to the growth and scaling of grey cast iron. He wanted to be quite clear that he understood that title, and he took it to mean that scaling was really an extreme form of growth. It was growth at the surface which was so great that the cohesion of the material was lost and the material flaked off. He wondered whether he was right in so interpreting it.

DR. NORBURY: That is right.

SIR HAROLD CARPENTER, continuing, said that the Paper was really dealing with growth in its broadest aspects, and scaling could be regarded as an extreme form of growth. The great and outstanding result of the Paper was that the authors had carried the question of the influence of silicon on growth much further than the late Professor Rugan and himself twenty years ago, for, whereas at that time they came to the conclusion that silicon was to be avoided if growth was to be prevented, the present authors had found a method of ensuring that silicon could actually reduce the growth to a negligible figure. It turned on the form of the carbon. The alloys which the speaker and his co-investigator worked upon were all of the coarse type, which contained all the conditions of excessive growth. The authors had shown that if the metallurgy of the alloys was properly appreciated and the conditions carefully controlled, graphite could be produced in a form which almost stopped the growth that would otherwise occur. That was a very great and important result, and, really, he thought, the most important result of the Paper.

The authors had shown quite clearly how silicon could be made a useful constituent. If it was present in sufficient amount it raised the gamma to alpha change point, and so the alteration of volume which was associated with that change did not take place when the alloy was heated, and, as the authors showed, silico-ferrite was itself more resistant to oxidation than pure ferrite. He was reminded, on reading that, that that result was actually predicted by Dr. Stead. It was to the authors' credit that they had succeeded in producing practical results from that point.

He desired to ask a question about the accelerated tests. The authors mentioned that if their alloys were heated in moist carbon dioxide the growth tests could be carried out very much more quickly than in air. He thought that was a very important and useful result, and he desired to know whether the products were exactly the same. Had they decided that?

Materials which had to withstand heat—cast-iron alloys—could be divided mainly into two types: (1) those which had to resist steady and prolonged heating at a fairly uniform temperature, and (2) those which had to be heated over a wide range of temperature rather suddenly. He thought the latter presented the more difficult type of problem to be solved.

Ingot Mould Practice.

The authors had rightly confined themselves to a general discussion of the scientific results without saying whether the alloys could be applied for particular purposes. But he would like to know whether they had found with any of these silicon alloys a suitable material for steel ingot moulds. That was one of the most difficult problems which had to be solved, and if the authors could mention the type of alloy suitable for that purpose they would be doing great service.

The use of cast iron for another purpose was also a somewhat difficult test to satisfy, namely, the fire bars of stokers, which reached a very high temperature. He wished to ask whether amongst these alloys the authors considered they had produced materials which would withstand such conditions satisfactorily. He was particularly interested in the section of ferrite, and he thought the authors' suggestion that the property which was required was not so much tensile strength as ductility, was very interesting and seemed to be very plausible. That did seem to fit in with the property which was most desired in this connection.

Finally, he would like to ask a perfectly general question. In any particular case could the authors now say that, within the limits required to be satisfied by practical conditions, this range of high-silicon alloys furnished materials of a type which would meet most practical problems?

He desired to say how much he admired the evidence presented in the Paper, particularly the very informing curves of the volume changes at the critical points, and the striking photograph shown in Fig. 8, indicating how not only scale formation, but also the oxidation of the iron, could be enormously reduced by raising the silicon from 2 to 7 per cent. That was really a most interesting piece of evidence, and showed very convincingly what the authors claimed that the alloy would do. He wished to express his sense of the importance of the Paper.

Structure and Scaling.

DR. M. BECKER thought that the authors had put forward very strong evidence in favour of high-silicon content for growth-resisting cast iron, and he felt that the results could not fail to be of very great practical value. He did not want to discuss most of the evidence given in the Paper, but he would like to venture a remark on one point. Were the authors quite convinced that the fine-graphite type of structure always offered superior resistance to scaling over the flaky type of structure? Judging from the diagrams in the Paper, he did not think that was altogether brought out. It was nothing like so important as the high-silicon content and the low total-carbon content. But it struck him that possibly the authors had other data on which they were basing that conclusion, and he would be very glad personally to know a little more on this subject. In Fig. 8, in the beautiful photo-micrograph to which Sir Harold Carpenter had referred, the iron which was the most resistant to oxidation and growth did not contain the fine super-cooled type of graphite as he understood it. On the other hand, the iron which did show oxidation and growth seemed to him to show, next to the scale, a type of structure which in this reproduction, at any rate, resembled very clearly the fine super-cooled type of graphite which they already knew. Of course, the silicon content on the right-hand side shown on Fig. 9 was very much higher than on the other, but it did seem to him that there was a case where the fairly small curly type of graphite was distinctly more resistant to scaling than the other type.

The CO-CO_2 Equilibrium.

It was generally said that a large quantity of silicon in iron led to a material which resisted oxidation. That, no doubt, was true in the sense that it prevented oxidation going on. But the first oxidation surely must take place more rapidly with an iron rich in silicon than with an iron with less silicon. Silicon oxide was a material with high heat formation, and the presence of silicon must make the iron oxidise more readily. He quite agreed that once the protective coating had been formed, then no doubt the further oxidation would be very much minimised. If oxidation of a metal did occur, one could regard on the surface of the metal an equilibrium taking place between carbon monoxide and carbon dioxide. With that oxidation equilibrium there would be a gradually increasing amount of carbon monoxide with heating temperature. The speaker drew a diagram on the screen to illustrate how the equilibrium curve for graphite would cross the oxidation curve at somewhere about 700 deg. C. atmospheric pressure. What was actually happening in the silicon cast iron might be that this oxidation line was raised to a greater degree. There was a tendency for oxides to form, but there was no tendency, if the temperature rose above the crossing-over point, for the oxides to be reduced. Did the authors think that was a possible explanation? It would be very interesting to himself in connection with other work on which he was engaged at the present time.

A Successful Application.

DR. A. G. ROBIETTE congratulated the authors on developing a most serviceable and useful heat-resisting material, which he thought would fill a long-felt need He had had experience of using this material on furnace structures, and the results bore out all that the authors claimed for it. The material was used as a supporting structure for a charge in an electric furnace, and the previously-used material was the so-called silicon heat-resisting cast iron, which generally stood for two to three months at a temperature of about 850 deg. C., but after that time the plates were badly warped and scaled. This new material had now been in the furnace for over five months, and it was absolutely immune from growth, and the condition of the surface was almost the same as when it was put in the furnace. It had been used continuously night and day.

There were many other potential applications of this material, and he would like to suggest one for which there seemed to be a need, namely, a container for molten metals and salts for hardening purposes. It would be very useful if the authors could give any results which would indicate whether these high-silicon cast irons would be immune to the corrosive attacks of molten metals such as lead, tin and aluminium, and salts such as sodium chloride and barium chloride and cyanides.

In a Paper which was read by Crockshott before the Institute of Metals last September, some comparative tests were given on the resistance to corrosion of various heat-resisting alloys such as nickel, chrome and heat-resisting steel, and it was found that grey cast iron stood up to attack by molten aluminium better than all these materials. The only disadvantage about using ordinary cast iron was that the outside of the container would be scaled too badly, but if the oxidation was reduced to such low limits as had been shown in practice and in this Paper, he thought that this material filled that need, except, perhaps, that there might be some contamination of the aluminium by the silicon in the cast iron.

Another use was for cyanide purposes. No material had stood up satisfactorily to the attack by molten cyanide. Nickel-chrome

* Printed in our issue of May 14, 1931.

material was almost useless, and mild steel seemed to be the only material which stood up to the corrosive attack of this salt, but the degree of resistance to oxidation of that material did not warrant its use. He wondered whether the authors could give any information on that subject.

Large-Sectioned Castings.

Mr. E. W. Colbeck said that at the present moment it was possible to state that this material was giving very good results where the castings were of comparatively small section, but as regards larger castings they were likely to come up against the possibility of the material being rather more brittle than normal cast iron. That was rather an interesting consideration. If the metals were taken which formed alpha-gamma loops with iron—chromium, aluminium, phosphorus and silicon—it was interesting to note that once an alloy was reached which was unmodifiable, brittleness was found at the same time. He wondered whether the authors could say that when they got an iron the alpha-gamma change of which was no longer discernible, very greatly-increased brittleness resulted. If one referred to the low total-carbon irons given early in the Paper, it would be found that the iron with 7.58 per cent. silicon contents was stated to have a change point at about 1,000 deg. C. That probably meant, he took it, that the change point was absent, or at any rate very feeble, and he was wondering whether, if one got to a silicon content of, say, 8.5 per cent., there would be a sharp break in the brittleness curve of the alloys.

With regard to the question of size of graphite flakes, he thought there was absolutely no doubt that to the three main causes for growth in grey cast irons given by the authors a fourth should be added, namely, size of graphite flakes. When one came to the irons of high-silicon content, quite another factor was being introduced, namely, the heat resistance of silico-ferrite, which might be sufficient in itself to overcome rather coarser graphite flakes; but certainly the size of the graphite particles played a tremendous part in the earlier stages of growth.

AUTHORS' REPLY.

Dr. Norbury, in reply, thanked the members who had taken part in the discussion, and particularly Sir Harold Carpenter, who had been in very close touch with the Association all through its history, and they were very grateful to him for the help he had given them. Sir Harold had spoken of the products of accelerated growth in CO_2, and asked whether they were the same as the products of oxidation in air with these irons. As a matter of fact, he and his colleagues found that the commercial conditions were very complicated, varying as between one commercial practice and another. There was no doubt a very great difference between a strongly-oxidising atmosphere and a weakly-oxidising atmosphere at the same temperature. That was a very important point, and in the application of these things commercially quite a large amount of data was now being obtained. Various members of the Association were making these irons and trying them out commercially. Another possible use was for material for ingot moulds. That was one of the first things which they tried out, but it was not suitable for that purpose, being too brittle. If molten metal were poured into this iron, the iron was too brittle to accommodate itself to the rapid change in temperature. That was the one bad property of this iron, namely, its brittleness. But experiments had been carried further, and now an iron had been developed which was very ductile and tough, and it was hoped that it might be suitable for ingot moulds. Actually it was more expensive than good-quality commercial iron, while the iron which was described in the Paper was only slightly more expensive. The nickel content of this new ductile material accounted for the increased expense.

The irons described in the Paper were very easy to machine provided the silicon content was not more than about 7 per cent. As the silicon content was increased they got harder and more difficult to machine, but with about 5 per cent. silicon they became very easy to machine, the metal chipping off under the tool.

Dr. Becker had asked whether the fine graphite showed greater resistance to scaling than the coarse graphite. The results in Fig. 6 showed this. The fine-graphite irons (the ones marked with a circle) showed lower oxidation figures than the coarse-graphite irons. Dr. Becker had also referred to the illustrations in Figs. 8 and 9 showing the low- and high-silicon irons after oxidation, and he had referred to the difference in the graphite structure. The low-silicon one had a fine-graphite structure, while the 7 per cent. silicon iron had a coarse-graphite structure; but, in spite of that, it had arrested scaling. If that iron, however, were repeatedly heated, it would doubtless fail, and he had rather chosen this instance to show the effect of silicon in stopping oxidation as distinct from growth. Dr. Becker's curve was very interesting, and what he said was very likely correct; the authors had not as yet had an opportunity of considering it.

He had been very much interested in Dr. Robiette's remarks about plates in the furnace standing up well. There, again, it was a question of resistance to oxidation without rapid heating. This iron had been tried for things like melting pots for aluminium and other molten metals, but if these pots were heated by means of an oil flame, as they usually were, the sudden heating from the oil flame caused the bottom of the pot to start cracking. If they were heated by electricity, it was very likely that the high-silicon iron would be suitable. They had tried the effect of molten zinc and aluminium on cast iron of various compositions, and they found the high silicon was rather better than ordinary grey iron in its resistance to molten metal attack. They would try molten salts and cyanides at some future date.

Catalogues Received.

Refractories.—Mr. Algernon Lewin Curtis, of Westmoor Laboratory, Chatteris, has used a 24-page well-illustrated brochure to outline the history of the use of high-alumina blocks for rotary cement-kiln linings. He takes his readers through the questions of using cement clinker, magnesite, slag bricks, firebricks, corundum, mullite, sillimanite and bauxite, pointing out where failure may be encountered. He then outlines the characteristics and details the analyses and applications of high-alumina brick of French origin. Finally, some notes on design of the blocks are given, accompanied by numerous illustrations, and including some notions on insulating. The catalogue certainly does the issuing house much credit.

Cylinder Iron.—We have received from the Midland Motor Cylinder Company, Limited, Birmid Works, Smethwick, Birmingham, an advance copy of a brochure which outlines the development of an alloyed cast iron known as "Chromidium." The underlying principles are (1) a reduction in phosphorus content to eliminate porosity, but which increases casting difficulties; (2) to overcome this the silicon is raised, but this softens the iron; and (3) to add chromium to stabilise the carbon in the combined form. Thus, by controlling these three factors, a pearlitic structure, free from hard spots, is claimed. Mechanical tests are outlined, and what is of outstanding interest is the controlled method of manufacture which is described and illustrated. We suggest that the only defect in this undoubtedly excellent piece of publicity matter is the omission of the magnifications of the photographs. We have not been informed as to whether the pamphlet is ready for distribution, but we are certain that recipients will find it a pleasure to handle and profitable to study.

Continental Steel Cartel.

The Managing Committee of the Continental Steel Cartel met in Budapest on June 12 and continued the consideration of the proposed new regulations of the Cartel. According to an official report of the proceedings, an agreement was reached on a number of important points, but in order to clear up the remaining points as soon as possible, it was decided to prolong by one month the existing agreement, which would otherwise have lapsed on June 30. An unconfirmed report states that representatives of the British steel industry were present at the meeting.

The total April production of the national groups contained in the Cartel was the lowest since the establishment of the Cartel. It amounted altogether to 1,970,000 tons, as compared with 2,097,000 tons in February and 1,980,000 tons in January; it was in April less by 219,000 tons than the tonnage fixed by the Managing Committee, as against a shortage of 92,900 tons in March. The German production at 743,000 tons in April showed a shortage of 221,000 tons as against 153,000 tons only in March; the French output at 675,000 tons in April was 15,000 tons above the quota as compared with an excess of 62,000 tons in March; the Belgian production at 245,000 tons in April exceeded by 3,000 tons the March figure, but was still 6,000 tons short of the quota; the Luxemburg output at 165,000 tons in April compares with 172,000 tons in March and represents a shortage of 10,000 tons in relation to the quota; while the production of the Saar district declined from 150,000 tons in March to 142,000 tons in April and was 3,000 tons below the quota.

An Italian Sand-Preparing Plant.

(*Concluded from page* 432.)

stages:—(1) Sand mixing, (2) sand mulling and (3) tempering. The machine consists of a rotating inclined drum, on the inside of which is fixed a number of blades. These lift up the sand and deliver it between two mulling cylinders, having a trapezoidal shape, which rotate in engagement with each other, compressing and rolling out a continuous layer of sand which passes between their surfaces. The travel of the sand through the machine is determined by the difference between the inclinations of the drum and the mulling cylinders. At the same time, a system of spraying nozzles, which can be regulated, delivers finely atomised water against the curtain of sand, falling constantly from the cylinders, imparting to it the desired content of moisture.

By this means a perfect mixing and exact mulling are obtained which guarantees, in a constant and certain manner, that the grains shall be intimately coated with a covering of clay, which is the final object of sand treatment. From this point it is only necessary to pass the sand, now thoroughly cleaned, mixed, tempered and uniformly mulled, through an ordinary disintegrator to make it ready for use in the moulding shop.

The two machines are intended for continuous operation, and to secure the maximum efficiency they should be employed in a regular and uniform manner. Each may be regarded as integrally bound up with the other, the best results being secured when they are used in conjunction. In most cases it will be necessary to provide a bucket elevator to raise the sand to the cleaning machine, a typical arrangement being shown in Fig. 3. The plants are supplied in a number of sizes, ranging from 6½ to 26 cub. yds. per hour.

The installation of sand-reclaiming and preparing plant of this type opens the way to the further rationalisation of all sand handling to and from the moulding shop, greatly facilitating the solution of the problems connected with this. The advantages obtained by such a system are obvious, and can be summarised thus:—(1) Considerable reduction in manual labour; (2) increased output; (3) reduced production costs; (4) fewer defective castings and better all-round quality of product; and (5) less fatigue on the part of the moulders, giving more accurate work.

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Trade Talk.

DR. W. ROSENHAIN, F.R.S., metallurgical consultant, announces that his address is now 39, Victoria Street, London, S.W.1.

CAST IRON SUPPLIES, LIMITED, 59, New Oxford Street, London, representatives of the Pont-á-Mousson pipe foundries, have been awarded the contract for the Dublin Corporation waterworks for the supply of 9-in. and 12-in. cast-iron pipes, concrete lined.

THE PORTUGUESE GOVERNMENT has awarded Messrs. Yarrow & Company, Limited, Scotstoun, Glasgow, an order for four torpedo-boat destroyers. The vessels are to be twin screw, 322 ft. in length, and to have a guaranteed speed of 36 knots. The propelling machinery will be turbines working in conjunction with Yarrow water-tube boilers. Two of the ships and their machinery are to be entirely completed by Messrs. Yarrow & Company at Scotstoun. The hulls of the other two will be built under the supervision of Messrs. Yarrow & Company at Lisbon, the machinery being supplied from Scotstoun.

THE DIRECTORS OF the Stanton Ironworks Company, Limited, in their report for the year ended March 31, state that the company's blast-furnace plant at Stanton is now completely modernised, and consists of five furnaces equipped with mechanical charging and the latest methods of assembling raw materials. The plant for making centrifugal iron pipes has been operating at high pressure throughout the year. An extension for doubling the output of iron pipes made by this process, between 4 in. and 6 in. in diameter, in lengths up to 18 ft., has been completed and is now in production. A further extension for making iron pipes 18 ft. long, in larger diameters, is now in progress. A new plant for making standard special castings, on mass production lines, for use with the company's iron pipes, is being put down at their Holwell Works.

Contracts Open.

Ankara, June 28.—48,280 kilogrammes of tool steel, for the Direction-General of Military Factories, Istanbul. The Department of Overseas Trade. (Reference G.X. 10,478.)

Calcutta, July 15.—3-ton and 7½-ton overhead travelling cranes, for the Agent, East Indian Railway, Calcutta. The Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1. (Fee 5s., non-returnable.)

Saffron Walden, June 27.—450 tons of 6-in., 5-in., 4-in. and 3-in. cast-iron pipes and specials, including well cylinders, for the Rural District Council. Messrs. Sands & Walker, consulting engineers, Milton Chambers, Nottingham. (Fee £3 3s., returnable.)

Spalding, July 6.—12,000 yds. of cast-iron pipes, etc., for the East Elloe Joint Water Board. Sir A. Binnie, Son & Deacon, engineers, Artillery House, Artillery Row, Westminster, S.W.1. (Fee £10, returnable.)

Wellington, Salop, July 6.—Pumping machinery, for the Urban District Council. Mr. E. Sandeman, consulting engineer, 15, Victoria Street, Westminster, S.W.1. (Fee £5 5s., returnable.)

Personal.

MR. F. C. YAPP, who has for many years been associated with Vickers, Limited, has been appointed a member of the board of Vickers-Armstrongs, Limited.

MR. GEORGE B. GARRETT, sales engineer for Messrs. Arthur G. McKee & Company, Cleveland, Ohio, has arrived in England for a business stay of some months. While in this country, Mr. Garrett will devote much of his time to observing the latest developments in the British iron and steel industry and in perfecting the working arrangement between his company and the Whessoe Foundry & Engineering Company, Limited, of Darlington, which recently formed an association with the McKee Company.

Will.

RICHARDSON, W. B., a member of the British Engineers' Association ... £11,109

Reports and Dividends.

Greenwood & Batley, Limited.—Final dividend of 2½ per cent., making 5 per cent. for the year.

Butterley Company, Limited.—Net profit, £90,024; brought in, £63,122; dividend of 5 per cent., tax free, for the year, £90,000; carried forward, £63,146.

General Electric Company, Limited.—Profit for the year to March 31 of £1,122,007. The directors have decided to recommend a dividend of 10 per cent. on the ordinary shares.

Harland & Wolff, Limited.—Profit, after writing off £250,000 for depreciation, £105,746; brought in, £132,307; carried forward, £238,053. The directors do not recommend the payment of any dividends.

James Keith & Blackman Company, Limited.—Credit balance, after providing for preference dividend, depreciation and reserves against doubtful debts, £34,074; dividend on the ordinary shares of 10 per cent., £15,500; carried forward, £18,574.

Electric Furnace Company, Limited.—Net profit, £4,400; brought in, £3,093; final dividend on the 7 per cent. cumulative preferred ordinary shares, making the full dividend for the year; carried forward, £1,892. No dividend is recommended on the ordinary shares.

Ransomes, Sims & Jefferies, Limited.—After providing for depreciation and debenture interest there was a loss of £28,348 for the year ended March 31. The preference dividend for the half-year to June 30 absorbed £5,500, but no further payment is recommended. The carry-forward is reduced from £59,577 to £25,729.

Stanton Ironworks Company, Limited.—Profit, after providing for taxation and contingencies and including dividends receivable from the Holwell Iron Company, Limited, and other investments, £264,193; directors' fees, £4,572; brought in, £132,720; interest on 4½ per cent. mortgage debenture stock, £33,656; preference dividends, £20,816; dividend of 10 per cent., tax free, on the ordinary shares, £113,670; reserve for depreciation, £50,000; carried forward, £174,197.

Allied Ironfounders, Limited.—Gross dividends declared by subsidiary companies out of profits for the year to March 31, £173,885; income-tax, £39,124; net dividends declared by subsidiary companies out of pre-merger reserves, £93,276; interest on gilt-edged investments, £232; brought in, £4,246; to capital reserve, £93,276; debenture interest, £35,650; to debenture redemption reserve, £12,143; dividend on the 7 per cent. cumulative preference shares, £53,956; carried forward, £37,489.

Obituary.

MR. WILLIAM COCKBURN has died in Newcastle at the age of 60. Mr. Cockburn was well known in Newcastle commercial circles, and was for about 40 years in the commercial department of the Consett Iron Company, Limited.

MR. SYDNEY J. JONES, managing director of Messrs. G. R. Jones & Company, Limited, steel and file manufacturers, Sheffield, has died, aged 71. Mr. Jones was formerly with Messrs. Edgar Allen & Company, Limited, for 17 years.

MR. HARRY ALLCARD, chairman and managing director of Messrs. Easterbrook, Allcard & Company, Limited, Sheffield, died recently. He was a member of the Institution of Mechanical Engineers and the Iron and Steel Institute.

MR. CHARLES THOMAS HEYCOCK, of Cambridge, whose death, at the age of 72, is announced, contributed much to the science of metallurgy. His researches won him admission to the Royal Society, which in 1920 awarded him the Davy medal. His work included chiefly the molecular complexity of metals when dissolved in other metals. He was associated in his work with Mr. F. H. Neville, and the researches for which they were responsible added greatly to the theoretical knowledge of metallurgy.

MR. ROBERT THEODORE WILSON, of Southcroft, Marton-in-Cleveland, a prominent figure for many years in the iron and steel trade, has died at the age of 75. He was the only son of the late Mr. Isaac Wilson, who founded the firm of Wilson, Pease & Company, which was later merged with the undertaking of Messrs. Pease & Partners, Limited. Mr. Robert Theodore Wilson was a partner in the firm for many years. He was a Justice of the Peace for the North Riding and a member of the Middlesbrough Exchange Company.

Company Meetings.

General Refractories, Limited.—The annual meeting of General Refractories, Limited, was held in Sheffield on Friday, May 22. MR. FRANK RUSSELL (chairman), who presided, said that despite the very difficult conditions the company continued to earn profits. They were exploiting the export market to the fullest possible extent, and with marked success, and were concentrating on those lines which were of the most general application. Some very large orders had recently been received and many more were the subject of negotiation, and as costs had been reduced to meet the altered conditions he had every reason to suppose that the company would secure a fair share of whatever business was available.

Whessoe Foundry & Engineering Company, Limited.—The annual meeting of the Whessoe Foundry & Engineering Company, Limited, was held in London on Friday, June 12. MR. HAROLD G. JUDD (the chairman), who presided, said that it was largely due to the thorough reconstruction of the works in 1929 that the company was in a position to make profits in a time of such extreme difficulty as they were experiencing. The year had been marked by some interesting developments which they believed augured well for the future of the company. They had entered into an arrangement with Messrs. Arthur G. McKee & Company, of Cleveland, U.S.A., who specialised in the construction of blast furnaces, steelworks, oil refineries and similar plant, under which the Whessoe Company was entrusted with the manufacture of such work in the United Kingdom as they could undertake. They hoped for substantial orders from this connection in the future and some important inquiries had already been received. Another development had been the institution of a research department. This had already produced some interesting suggestions as to new lines of specialities which were under consideration at the moment. They were doing everything possible not only to widen their field, but to fill it with as great a variety of products as possible.

Amalgamated Metal Corporation, Limited.—The annual meeting of the Amalgamated Metal Corporation, Limited, was held in London on June 3. MR. CHARLES V. SALE (the chairman), who presided, recalled that the corporation was formed to acquire, as from January 1, 1930, all the issued shares of the British Metal Corporation, Limited, and Henry Gardner & Company, Limited. Later, authority was given for the issue of shares in connection with the acquisition of shares in the Metallgesellschaft, of Frankfurt, and the Société Générale des Minerais, of Brussels. Continuing, he remarked on the continuous fall throughout the last 12 months in the prices of the four metals with which they were chiefly concerned. Taking the prices ruling on June 1, 1931, the percentage fall since December, 1925, was in the case of copper 40 per cent., tin 65 per cent., lead 68 per cent., spelter 73 per cent. The consumption of the four metals showed an uninterrupted increase during the four years ended 1929, but this increase was all lost in 1930, when consumption, so far as could yet be ascertained, was hardly above, and perhaps even below, the level of 1925. In these circumstances, world stocks had increased, though not so much as might have been expected, and with the slowing down of production under the influence of declining prices, the time must be approaching when the pendulum would reverse its swing. The wide range between high and low prices in the short space of five years was a very unsatisfactory feature of their trade. At one time the consumer was burdened and at another the producer was starved. He was aware of the arguments which might be advanced against restrictions upon replaceable commodities, the production of which could be rapidly expanded. In the case of base metals, however, they were dealing with materials which could not be replaced and were not inexhaustible, and so it should be easier to devise methods for bringing about a better organisation of supplies. This matter had for some time past been the subject of earnest consideration by leading producers the world over. Voluntary schemes for curtailing production were in active operation in the case of copper, tin and lead. The present schemes for tin and lead imposed no limitations upon the consumer and made no attempt to fix the price level. For these reasons they were more hopeful as efforts towards establishing a degree of price equilibrium beneficial to consumer and producer alike.

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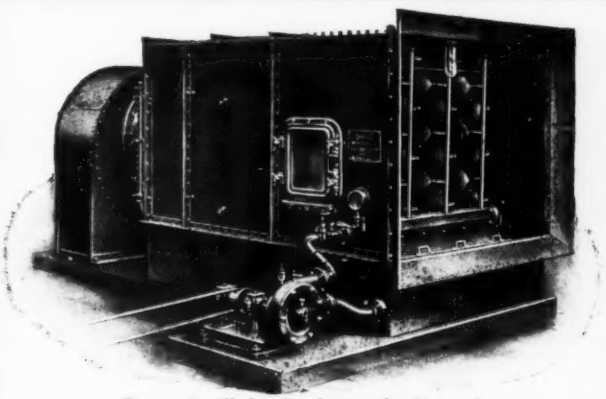

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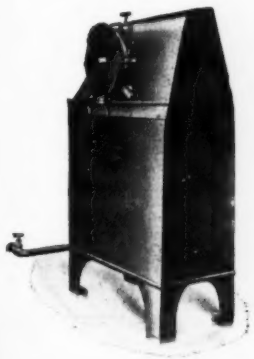

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SPECIAL STEEL FOR CONSTRUCTIVE PURPOSES.

The STEEL COMPANY OF SCOTLAND, Ltd.

Head Office: 37, RENFIELD STREET, GLASGOW:
Works: HALLSIDE, NEWTON and BLOCHAIRN, GLASGOW.

CONTRACTORS TO HOME, COLONIAL AND FOREIGN GOVERNMENTS.

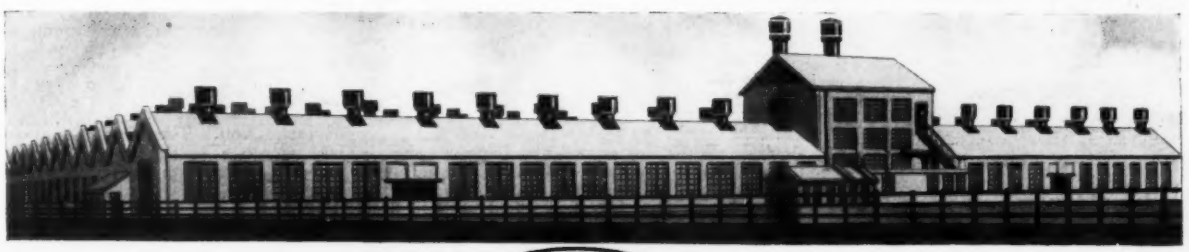
Established 1872. *Telegraphic Address: "Steel, Glasgow."*

THE HOME OF "QUALCAST" CASTINGS

Covering 4 acres.

THE MOST UP-TO-DATE FOUNDRY IN ENGLAND

Fully equipped with Moulding Machines for the production of highly finished Grey Iron Castings. "Qualcast" Castings are used by nearly all important car manufacturers and other large engineering firms as they help to reduce machining costs. Why not let us go into your proposition?



QUALCAST, LIMITED "QUALCAST" DERBY

Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—Very little business is being transacted on this market. It is admitted that locally-produced iron is not at a competitive price, that it is being undersold by foreign iron in Scotland, and that local works are obtaining both Continental and Midlands pig-iron at cheaper rates than are quoted by the Cleveland makers; but, nevertheless, the Cleveland ironmasters seem determined not to resort to price-cutting. They give the impression that if others like to sell their iron here below cost, and to suffer the consequent loss, that is their affair; but they cannot afford to sell iron several shillings below cost, and, rather than do so, they will lay more furnaces idle. The ironmasters further maintain that much of the cheaper iron is of inferior quality, and that a certain amount of Cleveland iron must be used for mixing. At all events, it is a fact that since output was last curtailed by the stoppage of a Cleveland blast furnace, sales have somewhat exceeded the current surplus available for the market, and some inroads have been made upon the stocks of iron which have accumulated at makers' works. Therefore, it would be idle to entertain hopes of cheaper Cleveland iron, but, on the other hand, the ironmasters must reconcile themselves to the continued arrival of Midlands and foreign pig-iron into the district. The fixed prices for all destinations, except Scotland, are unchanged, as follow:—No. 1 Cleveland foundry iron, 61s. per ton; No. 3 Cleveland G.M.B., 58s. 6d.; No. 4 foundry, 57s. 6d.; No. 4 forge, 57s. per ton.

Little change can be reported in conditions on the hematite market. Delivery has now been commenced under a substantial contract with Midlands consumers, but fresh sales of East Coast hematite are chiefly confined to moderate-sized parcels for early consumption. Prices are still steadily falling and there is a natural reluctance on the part of consumers to enter into commitments. Hitherto, opportunism has proved profitable for the buyer. Prices of raw materials are still falling, and, although makers with contracts for supplies are not in a position to take immediate advantage of the cheap material, they are adjusting their selling prices to the altered conditions. This week the quoted figure for East Coast mixed numbers has fallen to 63s. per ton, and it is possible that even this figure might be shaded for export orders, which are difficult to obtain. Bessemer mixed numbers on the North-West Coast are quoted at 66s.

LANCASHIRE.—In this area the long-continued depression in the textile-machinery trade is, of course, the most serious handicap to sellers of foundry iron. Export orders, also, are seriously restricted. For delivery to consumers in the Manchester zone, Derbyshire and Staffordshire descriptions of No. 3 are quoted at 67s. per ton, with North-East Coast iron also at 67s. The price of Northamptonshire foundry is 65s. 6d. and Derbyshire forge 62s. Scottish foundry brands are a little cheaper at about 87s. 6d., with West Coast hematite iron at 80s. 6d.

MIDLANDS.—Conditions remain static on this market. Buying is on the hand-to-mouth principle. For delivery to Birmingham and Black Country stations the furnaces still quote 62s. 6d. for Northants No. 3 and 66s. for Derbyshire, North Staffordshire and Lincolnshire No. 3.

SCOTLAND.—Business is strictly limited. In view of the coming holidays a quiet period is expected for some weeks to come. Scottish pig-iron makers are quoting as a fixed minimum price 71s. per ton for No. 3 foundry, f.o.t. furnaces, with a minimum of 2s. 6d. per ton extra for No. 1. The price of Continental No. 3 is 52s., f.o.t. Grangemouth. Middlesbrough No. 3 is at 59s.

Finished Iron.

The market is quiet. Few of the works are fully engaged, and the whole tone of the market is depressed. Staffordshire marked bars remain at £12 at works, and crown iron figures vary from £9 5s. to £10. The demand for nut and bolt iron is extremely slack at the rate of £8 12s. 6d. Most of the supplies for the current nut and bolt work come from the Continent, owing to the lower cost. The foreign product is offered, delivered works, at £4 12s. 6d. to £4 15s., and while this price disparity exists there cannot be much hope of the local ironworks obtaining the orders.

Steel.

Little trade is being secured by the finished-steel works. The consuming trades and the shipbuilding industry, in particular, remain very depressed. The decline in prices of Continental semi-finished steel appears to have been arrested, and for the time being quotations are steadily held. Very little business is being given out to either the Continental or home works. Prices of British semis are steady at the lower levels recently established. Owing to the low prices quoted, made possible by cheaper spelter and sheet bars, a little more business has been done in galvanised sheets, but not sufficient to make any material change in the situation at most of the works.

Scrap.

In the Cleveland area a few small orders were attracted by the recent price cuts. However, it cannot be denied that the bulk of the deliveries are being made against old contracts, owing to the prevailing industrial depression. Ordinary-quality cast-iron scrap is now down to 42s. 6d., with good machinery quality at 44s. Similar conditions prevail in other districts. Reports from South Wales and Yorkshire are equally depressing in their tone. In Scotland, the iron and steel scrap market is reported to be in a very unsatisfactory position. Few orders are being booked for new material, with the result that none of the works is fully engaged, thus still further weakening the scrap position. First-class machinery metal, in pieces not exceeding 1 cwt., is quoted at 47s. 6d. to 48s. 6d., while ordinary cast-iron scrap to the same specification is at 42s. 6d. to 43s. 6d. The above prices are all delivered consumers' works.

Metals.

President Hoover's announcement regarding international debts has been responsible for a considerable amount of activity on the London Metal Exchange. On Monday the prices of all metals advanced considerably, and much business was done. The rise was largely sentimental, but it is hoped that the American proposition will have a stabilising effect upon the metal markets generally.

Copper.—This market is unsettled, sentiment being mainly governed by Wall Street news. The outlook at the moment is rather uncertain.

Closing quotations :—

Cash.—Thursday, £33 11s. 3d. to £33 12s. 6d.; Friday, £33 10s. to £33 11s. 3d.; Monday, £36 2s. 6d. to £36 5s.; Tuesday, £37 7s. 6d. to £37 10s.; Wednesday, £37 12s. 6d. to £37 15s.

Three Months.—Thursday, £34 5s. to £34 6s. 3d.; Friday, £34 3s. 9d. to £34 5s.; Monday, £36 15s. to £36 17s. 6d.; Tuesday, £38 1s. 3d. to £38 2s. 6d.; Wednesday, £38 5s. to £38 7s. 6d.

Tin.—The tin market is less active. Fluctuations are inclined to be narrower. The negotiations for the creation of a tin "pool" are believed to be making favourable progress. It is intended to withdraw 30,000 tons from the market, reducing visible supplies by approximately 50 per cent. This should bring about a quick recovery from the present position.

Official closing prices :—

Cash.—Thursday, £101 10s. to £101 12s. 6d.; Friday, £104 10s. to £104 12s. 6d.; Monday, £108 5s. to £108 7s. 6d.; Tuesday, £108 17s. 6d. to £109; Wednesday, £107 17s. 6d. to £108.

Three Months.—Thursday, £103 to £103 5s.; Friday, £106 2s. 6d. to £106 5s.; Monday, £110 2s. 6d. to £110 5s.; Tuesday, £110 10s. to £110 12s. 6d.; Wednesday, £109 12s. 6d. to £109 15s.

Spelter.—While this market also improved sharply on the Hoover proposals, the fact remains that, while dull conditions persist in the brass and galvanised sheet industries, the actual rate of consumption of zinc can have improved but little. Any appreciation, therefore, lacks a firm basis.

Daily fluctuations :—

Ordinary.—Thursday, £11 1s. 3d.; Friday, £11 2s. 6d.; Monday, £12 7s. 6d.; Tuesday, £12 7s. 6d.; Wednesday, £12 16s. 3d.

Lead.—In common with the other non-ferrous metal markets, lead has now a better tone, due to the war-debt proposals.

The week's prices have been :—

Soft Foreign (Prompt).—Thursday, £11 2s. 6d.; Friday, £10 18s. 9d.; Monday, £12; Tuesday, £12 17s. 6d.; Wednesday, £12 15s.

Institute of British Foundrymen.

(*Concluded from page* 431.)

R. L. Rankin, Dumbartonshire; H. Rea, Newport; J. A. Reynolds, Prescot; R. J. Richardson, Pontypridd; N. D. Ridsdale, Middlesbrough; Councillor G. E. Roberts, Coventry; H. Roberts, Leeds; W. Robertson, Glasgow; H. J. Roe, Birmingham; F. W. Roe, Huddersfield; F. Russell, Sheffield; P. A. Russell, Leicester; S. H. Russell, Past-President, Leicester.

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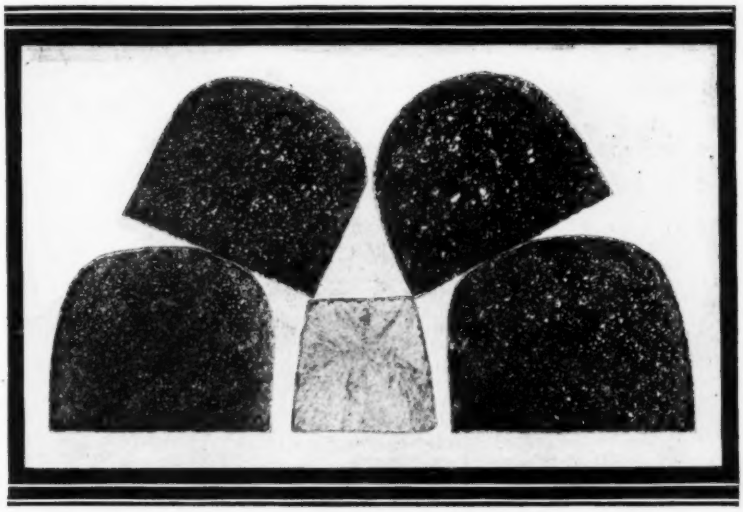
R. C. Waddell, Glasgow; A. Walker, Consett; G. Walker, Coalbrookdale; T. R. Walker, Sheffield; F. J. Wares, Peterborough; S. C. Warley, Smethwick; H. E. Warner, Manchester; Mr. Wass, Sheffield; G. R. Webster, London; R. D. Welford, Bradford; J. H. Westwood, Birmingham; H. Wharton, Sheffield; A. O. White, Wednesbury; T. Wilkinson, Stockton; L. P. Wilks, Wolverhampton; S. V. Williams, London; C. H. V. Wilson, London; F. P. Wilson, Immediate Past-President, Middlesbrough; R. Wilson, Wednesbury; W. R. Wilson, Liverpool; N. F. S. Winter, Halifax; H. Winterton, Dumbartonshire; D. H. Wood, Birmingham; S. W. Wise, Bradford; J. F. Wood, Wellingborough; A. S. Worcester, Huddersfield; T. J. Wragg, Birmingham; E. N. Wright, Wolverhampton; E. J. Yates, Stoke-on-Trent.

Iron and Steel Output in May.

The National Federation of Iron and Steel Manufacturers report that the number of blast furnaces in operation at the end of May was 80, a net increase of two since the beginning of the month, three furnaces having commenced operations and one having been blown out. Production of pig-iron in May amounted to 346,500 tons, compared with 323,200 tons last April and 614,500 tons in May, 1930. The production included 88,100 tons of hematite, 122,400 tons of basic, 107,100 tons of foundry and 14,300 tons of forge iron. The May output of steel ingots and castings amounted to 435,100 tons, compared with 397,400 tons last April and 691,900 tons in May, 1930.

The Lancashire Junior Section of the Institute of British Foundrymen are to visit the works of Messrs. Platt Bros. & Company, Limited, Hartford Works, Oldham, on June 27, by invitation of the directorate.

"Distington"
"Harrington"
"Solway"
"Workington"
Brands.



PIG IRONS WITH PERSONALITY!

Some pig irons have certain scarcely definable properties not wholly revealed by analyses, yet nevertheless present to a most marked degree, and such properties are best described by the term "personality." These pig irons of "personality" have achieved a reputation which has carried the demand for them far overseas.

"WEST COAST HEMATITE PIG IRON"

"West Coast Hematite Pig Irons," made by the Workington Iron & Steel Branch of the United Steel Companies Limited have "personality."

They enjoy a notable reputation amongst foundrymen, based on their freedom from deleterious elements, but they possess other important properties known to the foundryman under the term "body."

"West Coast Hematite Pig" is made from the firm's own ore, coke, limestone and other materials. That is why it is so remarkably "strong" and always consistent.

The sea-coast situation of the blast furnaces and the new docking facilities benefit consumers, especially for export.

Foundry managers and foremen are invited to call upon our technical advisory service. Our experts are always available for impartial advice upon pig-iron problems.

THE UNITED STEEL COMPANIES LTD.

WORKINGTON IRON & STEEL BRANCH

of The United Steel Companies Limited

WORKINGTON CUMBERLAND

WI2

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	37	12	6
Three months	38	5	0
Electrolytic	40	10	0
Tough	38	0	0
Best selected	38	10	0
Sheets	67	0	0
India	48	10	0
Wire bars	39	7	6
Do., August	39	7	6
Do., September	39	7	6
Ingot bars	39	7	6
H.C. wire rods	41	15	0
Off. av. cash, May	38	18	10¼
Do., 3 mths., May	39	11	10⅞
Do., Sttlmnt., May	38	18	10½
Do., Electro, May	42	13	1½
Do., B.S., May	40	16	4⅝
Do., wire bars, May	43	2	9
Solid drawn tubes			10d.
Brazed tubes			10d.
Wire			6¾d.

BRASS.

Solid drawn tubes	9d.
Brazed tubes	11d.
Rods, drawn	8¾d.
Rods, extd. or rlld.	5d.
Sheets to 10 w.g.	7⅞d.
Wire	7⅞d.
Rolled metal	7d.
Yellow metal rods	5d.
Do. 4 × 4 Squares	5¾d.
Do. 4 × 3 Sheets	5¾d.

TIN.

	£	s.	d.
Standard cash	107	17	6
Three months	109	12	6
English	109	0	0
Bars	111	0	0
Straits	109	10	0
Australian	102	15	0
Eastern	109	12	6
Banca	111	7	6
Off. av. cash, May	104	8	0
Do., 3 mths., May	105	14	10½
Do., Sttlmt., May	104	8	0

SPELTER.

	£	s.	d.
Ordinary	12	16	3
Remelted	10	15	0
Hard	8	15	0
Electro 99.9	14	12	6
English	12	17	6
India	11	0	0
Zinc dust	20	0	0
Zinc ashes	2	10	0
Off. aver., May	10	13	7⅛
Aver. spot, May	10	9	8¼

LEAD.

	£	s.	d.
Soft foreign ppt.	12	15	0
English	14	10	0
Off. average, May	11	12	8¼
Average spot, May	11	9	9¾

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	20	0	0
Do., V.M. ex-whf.	19	5	0
Rods	20	10	0
Boiler plates	13	5	0
Battery plates	15	0	0

ANTIMONY.

	£	s.	d.
Special brand, Eng.	34	0	0
Chinese	22	10	0
Crude	19	0	0

QUICKSILVER.

	£	s.	d.
Quicksilver	16	15	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

	£	s.	d.
Ferro-silicon—			
25%	7	7	6
45/50%	10	7	6
75%	15	2	6
Ferro-vanadium—			
35/50%	12/8 lb. Va.		
Ferro-molybdenum—			
70/75% c. free	4/2 lb. Mo.		
Ferro-titanium—			
23/25% carbon-free	9½d. lb.		
Ferro-phosphorus, 20/25%	£15	10	0
Ferro-tungsten—			
80/85%	1/8½ lb.		
Tungsten metal powder—			
98/99%	1/11½ lb.		
Ferro-chrome—			
2/4% car.	£29	0	0
4/6% car.	£21	5	0
6/8% car.	£20	12	6
8/10% car.	£19	17	6
Ferro-chrome—			
Max. 2% car.	£29	17	6
Max. 1% car.	£33	15	0
Max. 0·70% car.	£35	12	6
70% carbon-free	9¾d. lb.		
Nickel—99%	£170	0	0 to £175 0 0
Ferro-cobalt	9/- lb.		
Aluminium 98/99%	£85	0	0
Metallic chromium—			
96/98%	2/7 lb.		
Ferro-manganese (net)—			
76/80% loose	£10 15 0 to £11 5 0		
76/80% packed	£11 15 0 to £12 5 0		
76/80% export	(nom.) £ 9 0 0		
Metallic manganese—			
94/96% carbonless	1/3 lb.		

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	£0 2 0
Finished bars, 18% tungsten	£0 2 9

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to $\frac{1}{16}$ in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

	£	s.	d.	£	s.	d.
South Wales						
Heavy steel				2	2	6
Bundled steel and shrngs.	1	15	0 to	2	0	0
Mixed iron and steel				1	17	6
Heavy cast iron				2	5	0
Good machinery for foundries				2	7	6
Cleveland—						
Heavy steel				1	17	6
Steel turnings				1	5	0
Cast-iron borings				1	2	0
Heavy forge				2	13	0
W.I. piling scrap				2	10	0
Cast-iron scrap	2	2	6 to	2	4	0
Midlands—						
Light cast-iron scrap				1	15	0
Heavy wrought				2	7	6
Steel turnings					—	
Scotland—						
Heavy steel				1	17	6
Ordinary cast iron				2	0	0
Engineers' turnings				1	5	6
Cast-iron borings				1	10	0
Wrought-iron piling				2	8	6
Heavy machinery				2	8	0

London—Merchants' buying prices delivered yard.

	£	s.	d.
Copper (clean)	26	0	0
Brass	17	10	0
Lead (less usual draft)	8	5	0
Tea lead	5	5	0
Zinc	3	15	0
New aluminium cuttings	46	0	0
Braziery copper	23	0	0
Gunmetal	23	0	0
Hollow pewter	68	0	0
Shaped black pewter	43	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	61/-
Foundry No. 3	58/6
Foundry No. 4	57/6
Forge No. 4	57/-
Hematite No. 1	63/6
Hematite M/Nos.	63/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	73/6
,, d/d Birm.	84/6
Malleable iron d/d Birm.	115/-
Midlands—	
Staffs common*	—
,, No. 4 forge*	61/-
,, No. 3 fdry.*	66/-
Shrops basic	—
,, Cold blast, ord.	—
,, ,, roll iron	—
Northants forge*	57/6
,, fdry. No. 3*	62/6
,, fdry. No. 1*	65/6
Derbyshire forge*	61/-
,, fdry. No. 3*	66/-
,, fdry. No. 1*	69/-
,, basic*	—

*d/d Black Country dist.

Scotland—	
Foundry No. 1	73/6
,, No. 3	71/-
Hem. M/Nos. d/d	70/-
Sheffield (d/d district)—	
Derby forge	58/6
,, fdry. No. 3	63/6
Lincs forge	—
,, fdry. No. 3	63/6
E.C. hematite	78/6
W.C. hematite	82/6
Lancashire (d/d eq. Man.)—	
Derby forge	62/-
,, fdry. No. 3	67/-
Staffs fdry. No. 3	67/-
Northants fdry. No. 3	65/6
Cleveland fdry. No. 3	67/-
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	87/6
Clyde, No. 3	87/6
Monkland, No. 3	87/6
Summerlee, No. 3	87/6
Eglinton, No. 3	87/6
Gartsherrie, No. 3	87/6
Shotts, No. 3	87/6

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)	9	15	0 to	10	10	0
Nut and bolt iron				8	12	6
Hoops	10	10	0 to	12	0	0
Marked bars (Staffs) f.o.t.				12	0	0
Gas strip	10	10	0 to	12	0	0
Bolts and nuts, ¾ in. × 4 in.				12	5	0
Steel—						
Plates, ship, etc.	8	15	0 to	8	17	6
Boiler plts.	8	17	6 to	9	12	6
Chequer plts.				10	7	6
Angles				8	7	6
Tees				9	7	6
Joists				8	15	0
Rounds and squares, 3 in. to 5½ in.				9	7	6
Rounds under 3 in. to ¾ in. (Untested)	6	12	6 & up.			
Flats—8 in. wide and over				8	12	6
,, under 8 in. and over 5 in.				8	17	6
Rails, heavy	8	5	0 to	8	10	0
Fishplates				12	0	0
Hoops (Staffs)				9	5	0
Black sheets, 24g.	8	5	0 to	9	5	0
Galv. cor. shts. 24g.	9	15	to	10	0	0
Galv. flat sheets	10	5	0 to	10	10	0
Galv. fencing wire, 8g. plain				12	0	0
Billets, soft				5	0	0
Billets, hard				6	12	6
Sheet bars	4	12	6 to	5	0	0
Tin bars				4	12	6

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	10¼d.
Sheet to 10 w.g.	11¾d.
Wire	11¾d.
Rods	11¼d.
Tubes	1/4¼d.
Castings	11¾d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
3/- to 10 g.	1/4½ to 1/11½

with extras according to gauge.

Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	17.26
No. 2 foundry, Valley	17.00
No. 2 foundry, Birm.	12.00
Basic	17.26
Bessemer	18.76
Malleable	18.76
Grey forge	18.26
Ferro-mang. 80%	85.00
O.-h. rails, h'y, at mill	43.00
Billets	29.00
Sheet bars	29.00
Wire rods	35.00
	Cents.
Iron bars, Phila.	2.09
Steel bars	1.65
Tank plates	1.65
Beams, etc.	1.65
Skelp, grooved steel	1.65
Skelp, sheared steel	1.65
Steel hoops	1.85
Sheets, black, No. 24	2.15
Sheets, galv., No. 24	2.75
Sheets, blue an'l'd, No. 13	2.00
Wire nails	1.80
Plain wire	2.20
Barbed wire, galv.	2.55
Tinplates, 100-lb. box	$5.00

COKE (at ovens).

Welsh foundry	20/- to 22/6
,, furnace	15/-
Durham and Northumberland—	
,, foundry	13/-
,, furnace	13/-
Midlands, foundry	—
,, furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 box	14/-
,,	28×20 ,,	28/-
,,	20×10 ,,	20/3 to 20/7½
,,	18¾×14 ,,	14/9 to 15/-
C.W.	20×14 ,,	14/-
,,	28×20 ,,	27/6
,,	20×10 ,,	20/-
,,	18¾×14 ,,	14/9
Terneplates	28×20	31/- per box basis f.o.b.

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6 0 0 to £7 10 0
Bars, hammered, basis	£17 10 0 to £18 10 0
Bars and nail-rods, rolled, basis	£15 17 6 to £16 15 0
Blooms	£10 0 0 to £12 0 0
Keg steel	£32 0 0 to £33 0 0
Faggot steel	£20 0 0 to £24 0 0
Bars and rods dead soft, st'l	£11 0 0 to £14 0 0

All per English ton, f.o.b. Gothenburg.

TUBES AND FITTINGS.

Current Discounts.

	Tubes.	*Fittings.*
Gas	62½%	57½%
Water ..	58½%	52½%
Steam ..	55%	47½%

W.I. 12½% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.		
June	18 ..	33	11	3	dec.	15/-
,,	19 ..	33	10	0	,,	1/3
,,	22 ..	36	2	6	inc.	52/6
,,	23 ..	37	7	6	,,	25/-
,,	24 ..	37	12	6	,,	5/-

Electrolytic Copper.

		£	s.	d.		
June	18 ..	37	0	0	dec.	10/-
,,	19 ..	36	15	0	,,	5/-
,,	22 ..	38	5	0	inc.	30/-
,,	23 ..	39	5	0	,,	20/-
,,	24 ..	40	10	0	,,	25/-

Standard Tin (cash).

		£	s.	d.		
June	18 ..	101	10	0	inc.	7/6
,,	19 ..	104	10	0	,,	60/-
,,	22 ..	108	5	0	,,	75/-
,,	23 ..	108	17	6	,,	12/6
,,	24 ..	107	17	6	dec.	20/-

Tin (English ingots).

		£	s.	d.		
June	18 ..	102	10	0	No change	
,,	19 ..	105	10	0	inc.	60/-
,,	22 ..	109	5	0	,,	75/-
,,	23 ..	110	0	0	,,	15/-
,,	24 ..	109	0	0	dec.	20/-

Zinc Sheets (English).

		£	s.	d.		
June	18 ..	20	0	0	No change	
,,	19 ..	20	0	0	,,	,,
,,	22 ..	20	0	0	,,	,,
,,	23 ..	20	0	0	,,	,,
,,	24 ..	20	0	0	,,	,,

Spelter (ordinary).

		£	s.	d.		
June	18 ..	11	1	3	dec.	1/3
,,	19 ..	11	2	6	inc.	1/3
,,	22 ..	12	7	6	,,	25/-
,,	23 ..	12	7	6	No change	
,,	24 ..	12	16	3	inc.	8/9

Lead (English).

		£	s.	d.		
June	18 ..	12	10	0	dec.	5/-
,,	19 ..	12	10	0	No change	
,,	22 ..	13	10	0	inc.	20/-
,,	23 ..	14	10	0	,,	20/-
,,	24 ..	14	10	0	No change	

AVERAGE MONTHLY PRICES OF MARKED BARS (SOUTH STAFFS).

Year.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1897	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0
1898	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	8 0 0	8 0 0	7 11 8
1899	8 0 0	8 0 0	8 0 0	8 0 0	8 10 0	8 10 0	9 0 0	9 0 0	9 10 0	10 0 0	10 0 0	10 0 0	8 3 4
1900	11 0 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 5 10
1901	9 10 0	9 10 0	9 10 0	9 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 16 8
1902	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 5 0	8 5 0	8 5 0	8 5 0	8 5 0	8 5 0	8 7 6
1903	8 5 0	8 5 0	8 5 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 8 9
1904	8 10 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 10
1905	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 10 0	8 10 0	8 1 8
1906	8 10 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	8 10 0	8 10 0	8 10 0	8 10 0	9 0 0	8 15 10
1907	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0
1908	9 0 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 5 10
1909	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0
1910	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0
1911	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0
1912	8 10 0	8 10 0	8 10 0	8 15 0	9 0 0	9 0 0	9 0 0	9 8 0	9 10 0	9 10 0	9 10 0	9 15 0	9 1 6
1913	10 0 0	10 0 0	10 0 0	10 0 0	10 0 0	10 0 0	10 0 0	9 10 0	9 10 0	9 4 0	9 0 0	9 0 0	9 13 8
1914	8 12 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	8 14 4
1915	9 0 0	9 0 0	9 3 0	10 2 0	10 15 0	11 10 0	12 0 0	12 0 0	12 0 0	12 7 6	12 10 0	13 10 0	11 5 0
1916	13 10 0	13 10 0	14 13 0	15 0 0	15 0 0	15 0 0	15 0 0	15 10 0	15 10 0	15 0 0	15 10 0	15 0 0	14 18 7
1917	15 10 0	15 10 0	15 10 0	15 10 0	15 10 0	15 10 0	15 10 0	15 10 0	15 10 0	15 10 0	15 10 0	15 10 0	15 10 0
1918	15 12 6	16 0 0	16 0 0	16 0 0	16 0 0	16 0 0	16 0 0	16 0 0	16 0 0	17 0 0	17 0 0	17 0 0	16 6 3
1919	18 0 0	18 10 0	20 0 0	20 0 0	23 0 0	23 0 0	23 0 0	24 12 0	25 0 0	25 0 0	25 0 0	25 5 0	22 10 7
1920	26 17 6	27 0 0	28 0 0	30 5 0	30 10 0	33 10 0	33 10 0	33 10 0	33 10 0	33 10 0	33 10 0	33 10 0	31 10 2
1921	31 10 0	30 3 4	27 10 0	27 10 0	27 10 0	24 15 0	21 0 0	20 0 0	20 0 0	17 10 0	17 0 0	16 0 0	23 7 4
1922	16 0 0	14 17 6	14 10 0	13 10 0	13 10 0	13 10 0	13 10 0	13 10 0	13 10 0	13 10 0	13 10 0	13 10 0	13 18 1½
1923	13 10 0	13 10 0	13 16 0	14 7 6	14 10 0	14 10 0	14 10 0	14 10 0	14 10 0	14 10 0	14 10 0	14 10 0	14 5 3½
1924	14 10 0	14 10 0	14 10 0	15 0 0	15 0 0	15 0 0	15 0 0	15 0 0	15 0 0	15 0 0	15 0 0	14 17 6	14 17 3½
1925	15 0 0	15 0 0	15 0 0	15 0 0	15 0 0	14 10 0	14 10 0	14 10 0	14 10 0	14 10 0	14 10 0	14 0 0	14 13 4
1926	14 0 0	14 0 0	14 0 0	14 0 0	14 0 0	14 0 0	14 0 0	14 0 0	14 0 0	14 0 0	*	14 10 0	14 0 10
1927	14 10 0	14 10 0	14 10 0	14 10 0	14 10 0	13 10 0	13 10 0	13 10 0	13 10 0	13 0 0	13 0 0	12 18 0	13 15 8
1928	12 10 0	12 10 0	12 10 0	12 2 6	12 0 0	12 0 0	12 0 0	12 0 0	12 0 0	12 0 0	12 0 0	12 0 0	12 2 8½
1929	12 0 0	12 0 0	12 0 0	12 0 0	12 0 0	12 0 0	12 0 0	12 0 0	12 0 0	12 7 6	12 10 0	12 10 0	12 2 3½
1930	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 15 0
1931	12 10 0	12 10 0	12 10 0	12 8 0	12 0 0	—	—	—	—	—	—	—	—

* No quotation available.

WILLIAM JACKS & COMPANY,

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18, BENNETTS HILL, BIRMINGHAM.
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All grades FOUNDRY, HEMATITE, BASIC, SPECIALS, &c.

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(A remittance should accompany instructions.)

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BRASS-FOUNDRY Foreman seeks situation; good practical moulder; age 41.—Box 820, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

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Any Member, Associate Member or Associate of the Institute of British Foundrymen who desires his qualifications to be inserted in the column must forward to the General Secretary of the Institute the following information:—(a) Name and address; (b) name of present employer (or last employer if unemployed); (c) brief particulars of qualifications, experience, and type of position required. The name will not be disclosed until the candidate is in communication with a prospective employer. Announcements will be inserted in two successive issues, unless announcers' requirements have been met with in the meantime.

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Will Sell whole or in lots to suit customers or Let on favourable terms. Unique opportunity for Manufacturers.

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TO Engineers, Founders, Manufacturers.—Fine site of nearly three acres on arterial road, with Foundry and Workshops and own Rail Sidings into the premises. Modern Offices, Warehouses and Workrooms. Central Heating. —CHARLES A. TRICKS & SON, Auctioneers, St. Nicholas Street, Bristol.

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SAND MIXERS.—New and Secondhand. Ask us to quote.—W. BREALEY & COMPANY, LIMITED, Station Works, Ecclesfield, Sheffield.

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ROBINSON 30-in. Plane Iron Grinder.

JANVIER Die Copying Machine, with 8 faceplates up to 24 in. dia.

"EVER-READY" Electric Table Surface Grinders, 14-in. and 20-in. dia. stones.

B.S.A. Centreless Grinders, for work about 1 in. dia. x 6½ in. long.

"Raymond" ROLLER MILL, to reduce about 6 tons of bituminous coal per hour so that 90 per cent. will pass 100 mesh.

"Winget" No. 2 HAND-POWER PORTABLE CONCRETE BLOCK-MAKING MACHINES, to make blocks about 18 in. x 9 in. x 4½ in. and less, with palletts.

About 25/30 tons of Good Secondhand GALVANISED CORRUGATED SHEETS, about 7 to 8 ft. long.

WIRE ROPES, $\frac{13}{32}$ in. dia., 360 ft. long.
WIRE ROPES, $\frac{5}{16}$ in. dia., 1,000 ft. long.

(ASK FOR "ALBION" MACHINERY CATALOGUE.)

ALBION WORKS, SHEFFIELD.

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GANISTER, best quality for cupolas, also for Steel Works.—ASTBURY SILICA COMPANY, "The Brooms," Park Lane, Congleton.

½-CWT. Plain Firebars wanted, in 10-ton lots; Humber district.—Box 822, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

MISCELLANEOUS—*Continued.*

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IN STOCK

Small Jackman SM4 Aerator...	£12
Halls "Invincible" mixer ...	£18
"Herbert" mixer, as new ...	£32
All above BALL BEARING.	
5 ft. Universal Sandmill... ...	£26
6 ft. "Jackman" sandmill ...	£38
Pneulec Oils and Mixer, type PM	£14
"Macdonald" air riddle as new	£10

ALEX. HAMMOND, *Foundry Machinery Merchant,*
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Bradley's

MIXTURE SERVICE

The Bradley Mixture Service is designed to enable the full benefit of Refined Irons, their unique properties, uniformity of quality and composition, to be available to the general foundry public.

The service is based upon a standard series of Refined Irons of guaranteed composition of which a stock is held continuously available at twenty-four hours' notice.

Full particulars of the Bradley Mixture Service are contained in an interesting booklet, a copy of which will be sent free on request.

BRADLEY & FOSTER LIMITED
IRONMASTERS
DARLASTON, STAFFS

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PETER—WITH ONE EXCEPTION

With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun, and on occasions—be it admitted—of naughtiness. Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice-Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception. Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea?

The Chairman,

SCHOOL FOR THE BLIND
(FOUNDED 1838)
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PIG IRON

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CASTINGS

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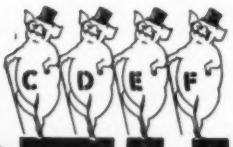
ARMSTRONG WHITWORTH



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Machine or Sand Cast Pig as required.

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When remelted an iron of unequalled solidity, close grain and strength is obtained.

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Please address enquiries to Sir W. G. Armstrong Whitworth & Co. (Ironfounders), Ltd., Close Works, Gateshead-on-Tyne

Improved Rapid Cupola

Fitted with PATENT TUYERE DOORS

by means of which each tuyere can be quickly and easily regulated or closed from a convenient position, without obtaining access to the air belt.

Also the

Osborn Patent Spark Arrester

The advantages of which are:—

Immunity from sparks and grit.

Avoids damage to roofs, choking up of gutters.

Prevents danger of fire.

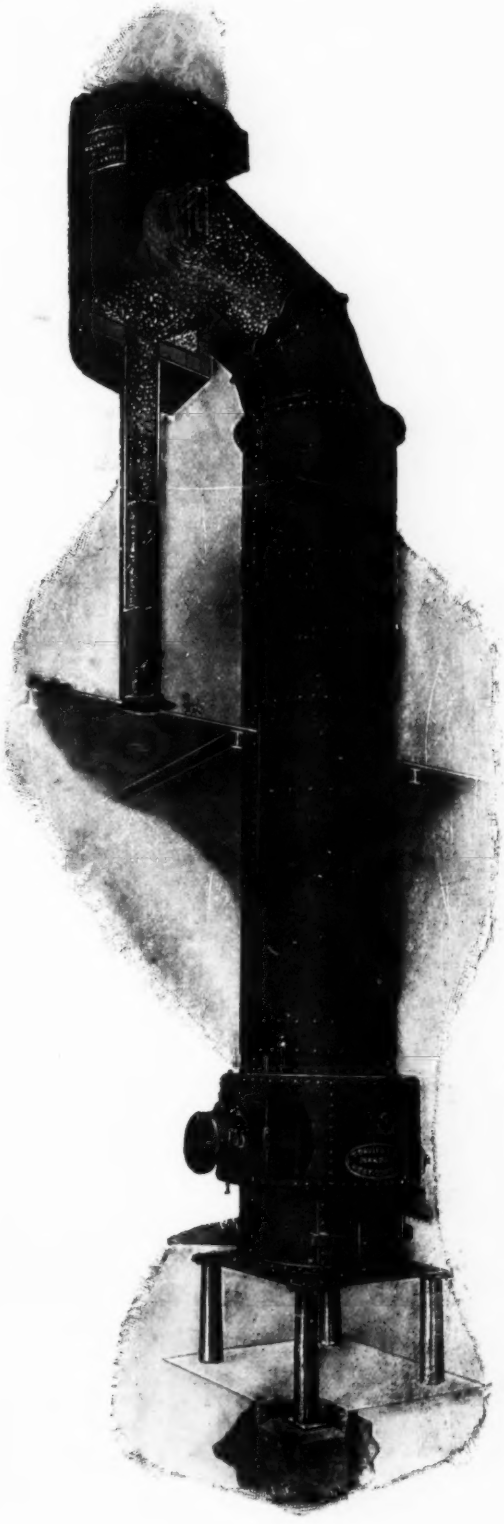
Important labour saver.

Conducts the dust down to or through the charging platform, where they can be dropped into a cart without handling.

Constructed in flanged sections to facilitate erection.

Cannot get overheated, being lined with firebricks.

Can be fitted to existing cupolas.



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STAVELEY
SAND-SPUN
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6, 8 & 10 in. Diameters
in
16 feet Lengths
With or without beads on Spigots

NOW AVAILABLE

THE STAVELEY COAL & IRON
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. . . the best sand
. . . is prepared by
. . the cheapest method

The Pneulec-Royer conditions sand for a less cost per ton than is possible by any other method . . . and conditions better too. These advantages are due entirely to the belt principle of operation, and, of course, the Pneulec-Royer is the only machine in the world which operates on this principle. The teeth on the belt have a peculiar type of tearing action, and a feature of sand from this machine is its uniformity. Moisture and bond are even throughout the pile, and the sand is properly cooled down. Scrap is separated, and discharges automatically from the bottom shutter. Altogether there have been over 1300 machines installed to date, and this alone is proof positive that the Pneulec-Royer really does help reduce production costs. We shall be pleased to send descriptive folder, and also advise on the benefits you would obtain by the installation of

the Pneulec-Royer

Photograph by courtesy of Messrs. Clegg & Howgate, Ltd., Phoenix Steel Works, Bingley, Yorks.

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cupolas, core oils | core and mould drying stoves | moulding machines, oilsand mixers | furnaces, sand drying plant | sand mixing and conveying plant | Royer sand mixer, electric swing grinders

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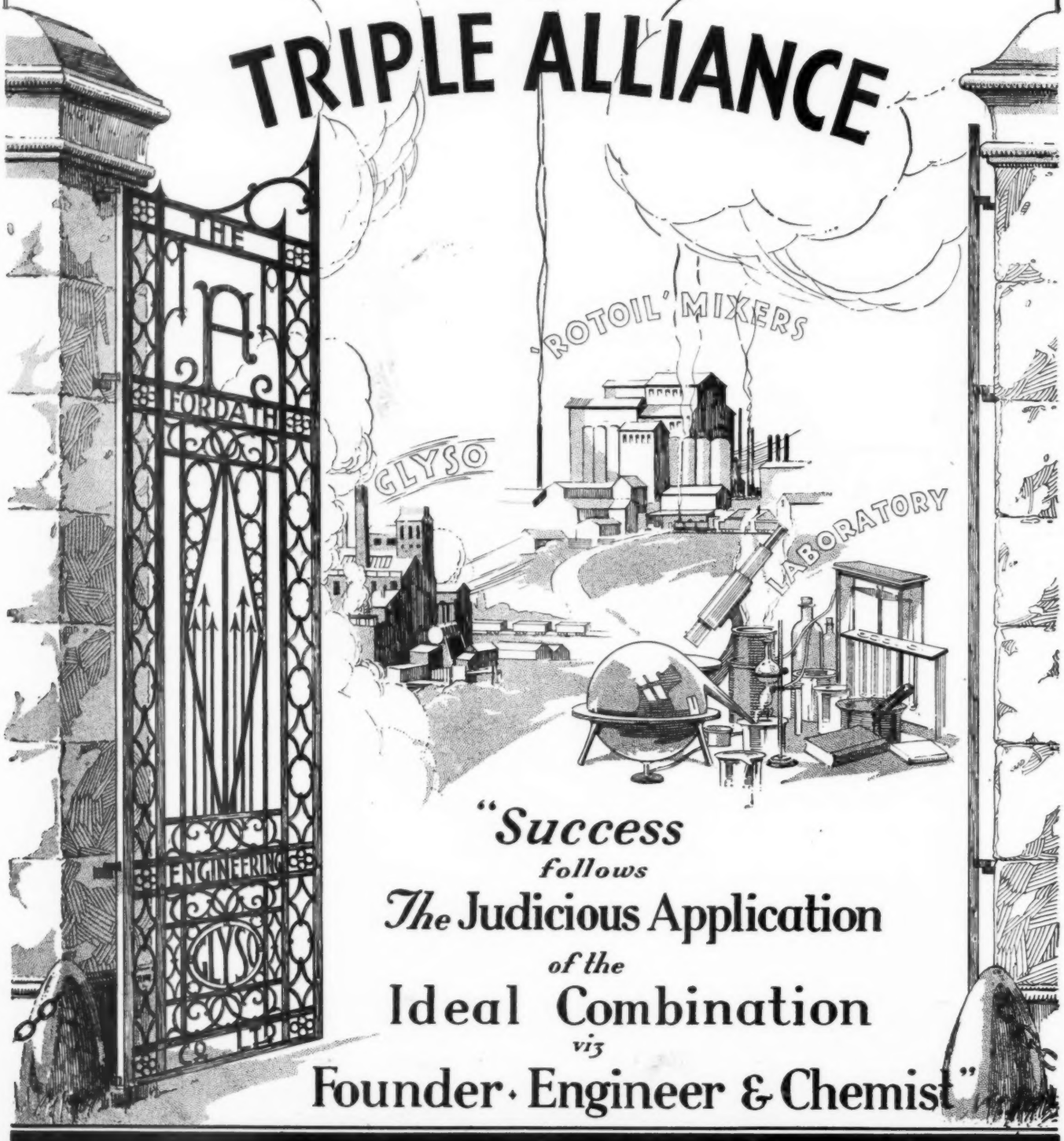
The TRIPLE ALLIANCE



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WEST BROMWICH ENGLAND

TELEGRAMS: METALLICAL.

Instal this fan in your
FOUNDRIES, WORKSHOPS, FURNACE ROOMS, ENGINE ROOMS, OFFICES, *etc.*

WHEN the outside temperatures reach 70°, 80° and 90° in the shade your workers will appreciate the cooling effect of "BLACKMAN" Ventilating Fans. If you have not already installed these fans in your Workshops and Offices, you should seriously consider the advisability of doing so now. Write, wire or 'phone us for descriptive Catalogue FV—1 and expert advice on ventilating matters, or ask us to send a representative to discuss your particular problems with you on the spot. JAMES KEITH & BLACKMAN CO., LTD., Head Office, 27, FARRINGDON AVENUE, LONDON, E.C.4. Telephones: Central 7091 (9 lines). Telegrams: James Keith, Phone, London.

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SUITABLE FOR ENGINEERING, LIGHT CASTINGS, BATHS, MOTOR CYLINDERS, AND ALL FOUNDRY FORGE & STEEL WORKS PURPOSES

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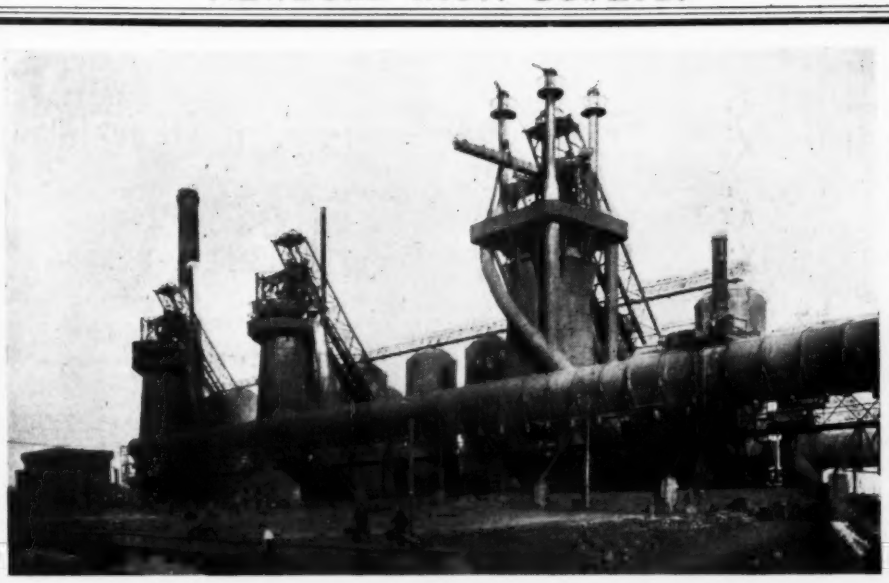

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·50% to 5%

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trace to ·10%

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·30% to 4%

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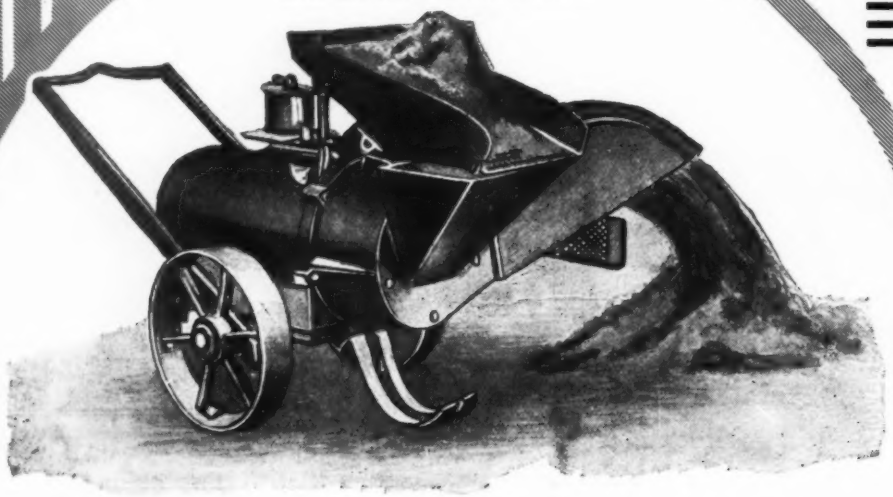
ENGLISH PATENT Nos. 293225/6



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SPEED PRODUCTION AND LOWER COSTS

While primarily a sand-conditioning machine the COLEMAN PROSAMA Sand-Thrower has many exclusive labour-saving applications, such as filling overhead sand bins, conveying from one location to another quickly, cooling sand, &c. These features make the machine of outstanding value to every progressive foundry.

IT BLENDS
MIXES
AERATES
CONDITIONS
SEPARATES &
COOLS
FOUNDRY SAND

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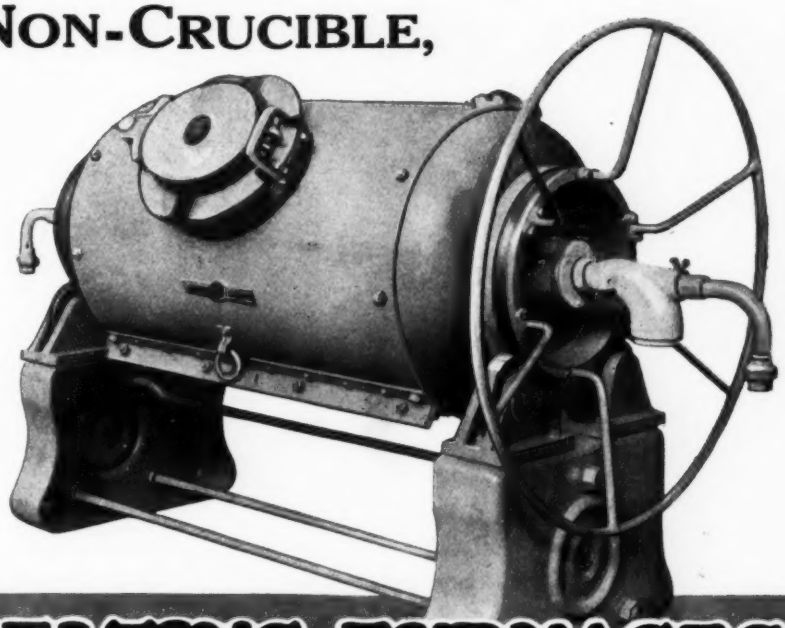

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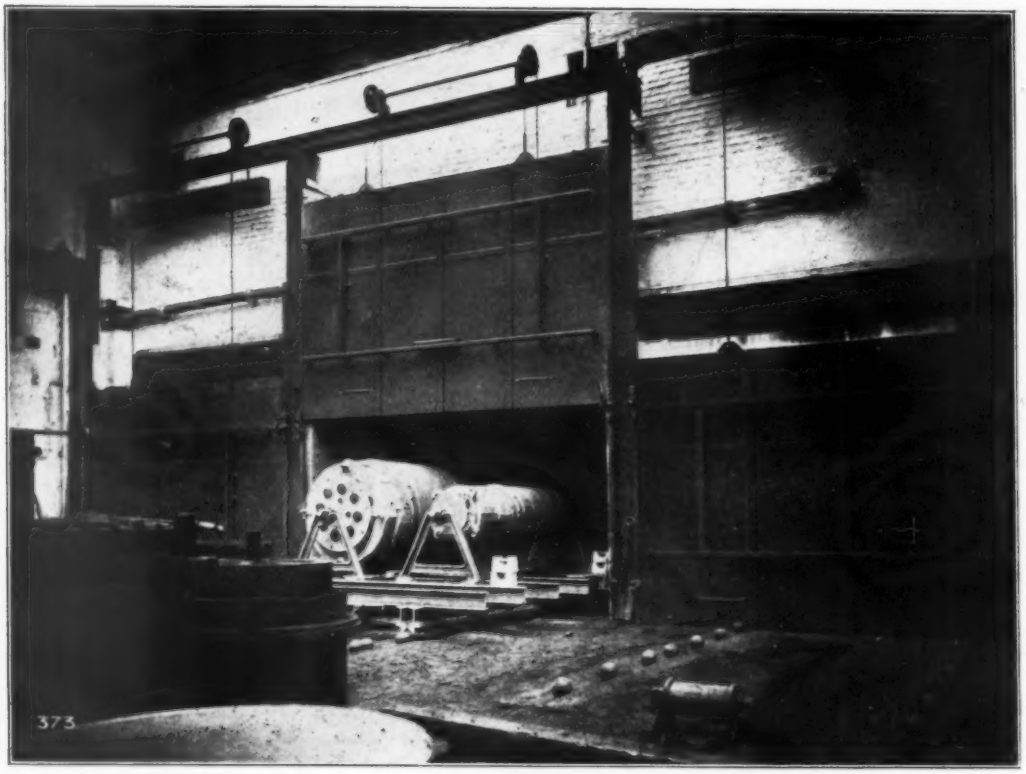

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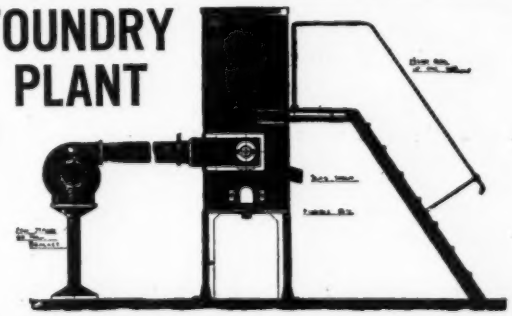

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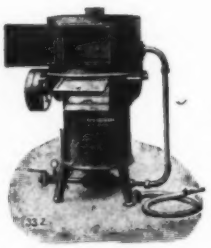

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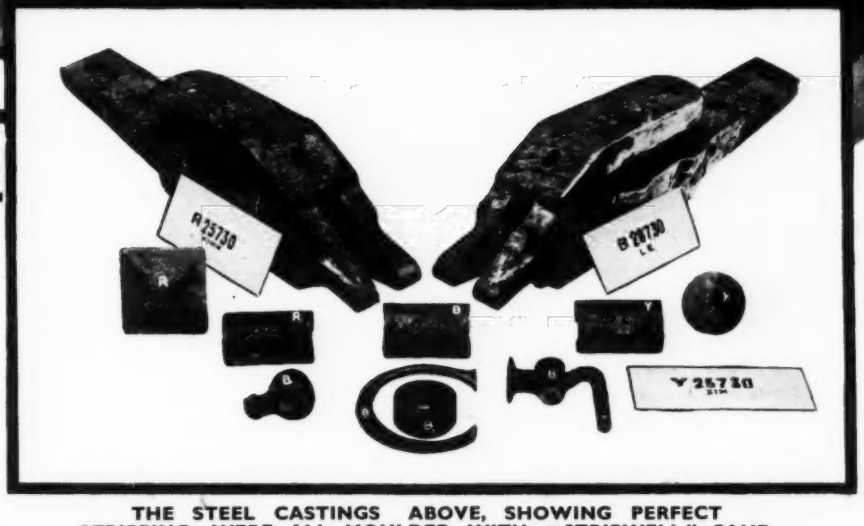

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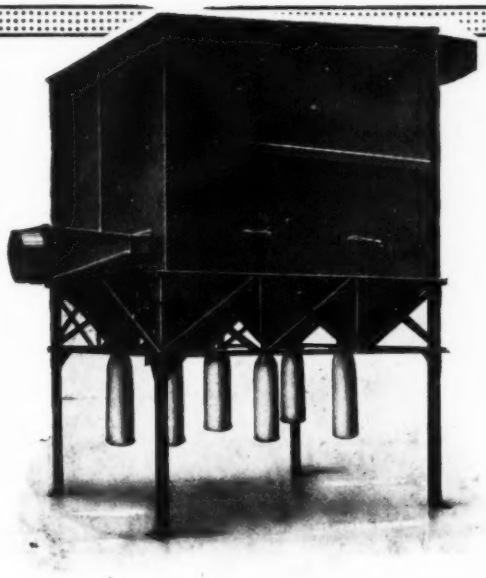

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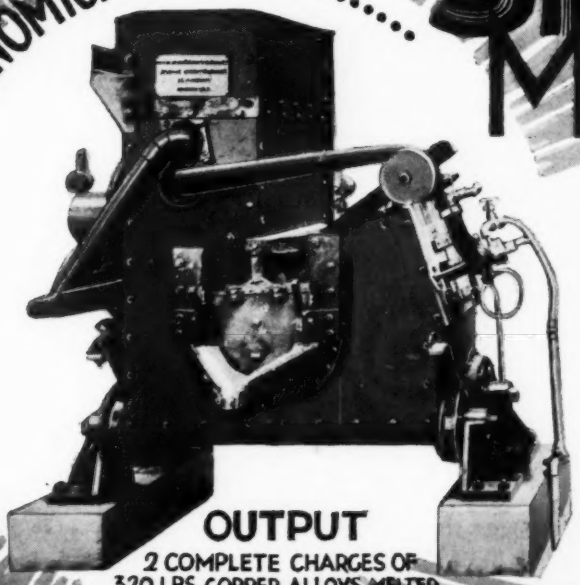

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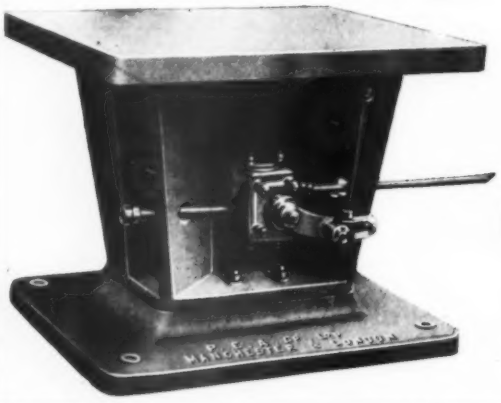

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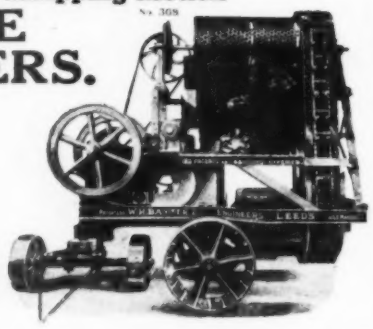

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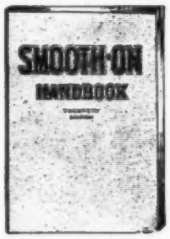

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